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Curriculum Planning Template

Subject: Science (Physics) Year 9 Ability ALL

Term / Date(s)

Topic	Magnetism	Electromagnetism	Wave properties	Wave effects	Energy	Particle Model of Matter	Electricity
Topic overview **Students will learn…**	The effects of magnetism and magnetic fields.	The principles of using the magnetic field around a wire to produce an electromagnet	Understanding the physical model of a transverse wave	How energy is transferred as a wave through a substance	to recall stores and transfers of energy and apply these to systems. how to quantify changes in energy to systems and how energy is conserved and dissipated. how energy is generated and transported.	to utilise a particle model to predict the behaviour of solids, liquids and gases and their behaviour when exposed to different temperatures and pressures. to calculate changes in thermal energy and energy required for a change in state. That the internal energy of a system and the effect of changes of state and temperature on this.	to interpret and construct circuit diagrams. to explain the different types of circuits and components and their effects on circuit behaviours. how to quantify the changes in the electrical circuits. how mains and portable electricity differ.
What Golden Knowledge will pupils learn and remember ?	Students will be able to identify that magnetic materials, electromagnets and the Earth create magnetic fields in order to be able to draw these using magnetic field lines to represent their strength and direction. Students will use diagrams of field lines to show the direction of field lines from North to South which will enable them to draw magnetic field lines of electromagnets. Students will apply their knowledge of electric fields to be able to describe how the strength	Students will be able to prove through experimentation how the strength of an electromagnet can be changed in order to know that increasing the number of turns in the coil increases the strength of the electromagnet. Students will use their knowledge of magnets to draw the magnetic field around an electromagnet in order to describe how its force changed with distance. Students will be able to explain the choice between an electromagnet and a	Students will be able to describe the wave model, specifically how to label a wave, in order to describe the properties of transverse and longitudinal waves. Students will be able to explain how waves move in order to describe that waves move through vibrations from one position to another but the material (particles e.g. water particles) do not move. Students will investigate how particles move in transverse and longitudinal waves in	Students can describe light and other waves, in terms of their frequency in order to explain differences in the damage done to living cells. Students will be able to explain how the particles in a wave move as energy is transferred in order to be able to describe the difference between transverse and longitudinal waves Students will understand that waves transfer energy and be able to explain how frequency and amplitude affect the	Students will be able to state the 8 energy stores and 4 energy transfers so that energy transfers within closed and open systems can be understood and the conservation of energy is apparent. Students will be able to identify useful and wasted energy in various scenarios so that machines can be evaluated and the concept of work done can be applied and changes in energy involved can be calculated. Students will be able to explain the concept of an	Students will understand density in different materials and how to calculate density. This will allow them to determine density of a regular and irregular object. Students will be able to compare how density is calculated from regular and irregular solids. Students should be able to apply the equation for density. Students will be able to use the particle model to describe changes of state and the energy transfers that take place using graphical interpretation. This should allow the students to explain any changes of state in terms of energy and particles. Students should understand and be able to apply their knowledge of	Students will learn about different circuit symbols. This will allow them to accurately draw and interpret circuit diagrams. Students will learn to apply a number of electricity equations, this will allow them to quantify the effects of electrical components. Students will learn about the resistance of different components and this will allow them to explain how a circuit would work or to choose the correct components for a particular application. Students will learn about the relationship between potential difference, current and resistance.

	of a magnetic field changes with distance. Students will know that opposite poles attract and like poles repel in order to predict whether something will attract of not. Students will be able to use their knowledge of the structure of the Earth in order to describe the source of the Earth's magnetic field. Students will be able to predict the pattern of field lines and the force around 2 magnets placed near each other in order to be able to describe how compasses are used in navigation. Students will be able to predict the effect of rolling a magnetic object through a magnetic field, in order to later apply this knowledge to the motor effect.	permanent magnet for a device, this will enable them to critique device designs and suggest improvements. Students will be able to describe how devices using electromagnets work in order to link this to how bells, circuit breakers and loudspeakers work.	order to compare and contrast each form Students will use the wave model in order to explain observations of the reflection, absorption and transmission of a wave. Students will observe how waves are reflected in order to be able to suggest what might happen when two waves combine. Students will understand how waves can meet to reduce or amplify the total energy transferred when they combine	amount of energy transferred. Students will be able to describe how high energy waves can affect cells and therefore be able to predict the dangers of exposure to some of these waves Students will know that vibrations transfer energy in order to be able to explain how ultrasound can be used to clean equipment Students will be able to describe how sound vibrations can generate an electric current in a microphone in order to be able to explain how sound can be transferred over long distances	efficient system and should be able to demonstrate wasted energy and how to reduce unwanted energy transfers. Students will learn different forms of energy, using an equation to show how the energy is calculated. This will enable students to calculate the amount of energy stored and use the rearranged equation to calculate other terms. Students will then be able to calculate the amount of energy transferred usefully as wasted energy. Using this knowledge students will be able to calculate the efficiency of an energy transfer using an equation. Students will know how energy is generated globally and separated into non-renewable energy resources and renewable energy resources, this will be used to explain the global energy demands. They will be able to evaluate the use of renewable and non-renewable energy resources. Students will be able to use this knowledge to explain finite and renewable resources and the environmental impact these resources have vs the reliability and cost effectiveness of a sustainable energy model.	internal energy within various systems. The students should also be able to use the term internal energy to describe thermal energy stores. Students should be able to describe and explain the changes to specific latent heat when applied to changes of state. Students should learn the differences between specific latent heat of fusion and vaporisation. They should be able to use this knowledge to distinguish between examples for each. Students should be able to interpret heating and cooling graphs within the context of specific latent heat and changes to state. Students should be able to describe the random motion of gases and how a variety of factors can change this motion. Students should be using this knowledge on the motion of gases to how pressure, volume and temperature have a qualitative relation to the motion of gas particles. Students should be able to describe the random motion of gases and how a variety of factors can change this motion. Students should be using this knowledge on the motion of gases to how pressure, volume and temperature have a qualitative relation to the motion of gas particles.	This will allow them to explain how resistance can change in various components and length of wire. Students will be able to identify series and parallel circuits and explain how current, potential difference and resistance behave in them. This will allow them to correctly calculate quantities in the circuit and explain which circuit is most appropriate in different applications. Students will learn about the energy transfers. This will allow them to calculate electrical power and work done. Students will learn about domestic electricity, this will allow the students to identify features of a 3 pin plug and state the importance of each component. Students will then be able to use this knowledge so that they can explain what happens during electrocution in terms of a potential difference between a person and a live wire.

					Students will be able to explain the national grid to state the components of the national grid.		
What prior knowledge should pupils already know?	Students should be able to observe how magnets interact with each other and understand that these interactions are caused by a magnetic force. (KS1 NC Forces and magnets) Students should know that magnets have a North and South pole and be able to identify that like poles of a magnet repel and opposite poles attract one another. (KS1 NC Forces and magnets) Students should be able to identify which materials will be attracted by a magnet and which will not. (KS2 NC Forces and magnets)	Students should know that some forces can act on an object while not making contact and that magnetism is one of these. (KS3 Year 7 forces, KS3 year 8 forces) Students should know that forces are measured in newtons and can be measured with a newton meter. (KS3 – Year 7 forces and KS3 year 8 contact forces and pressure) Students should know that a permanent magnet has a North and South pole and that they are permanently magnetic. (KS2 – NC forces and magnets) Students will be able to draw magnetic fields and use them to identify that the field lines go from North to South. They will also be able to describe how the strength of the magnetic field changes with distance. (KS2 – NC forces and magnets) Students should be able to identify which materials will experience a magnetic force. (KS2 NC Forces and magnets)	Students will understand that waves transfer energy and be able to explain how frequency and amplitude affect the amount of energy transferred. (KS3 – Sound and Light)	Students will be able to interpret a wave form from an oscilloscope describing the amplitude and frequency KS3 – Wave properties) Students will have evaluated data to make informed judgements to be able to present their ideas in a clear and logical way (KS1-3 – working scientifically)	Students should be familiar with the term energy stores and transfers. (Physics Y7 energy transfer) Students should be able to explain that work done is linked to energy transfer (Physics Y8 work) Students should be able to explain the idea of energy being conserved and dissipated. (Physics Y7 energy transfer) Students should be able to apply an equation if given to them. (Physics Y7 energy costs) Students should be able to recall different renewable energy resources. (Physics Y7 energy costs) Students should be able to define the terms: renewable, non-renewable, efficiency, wasted energy. (Physics Y7 energy costs) Students should be able to explain how thermal energy is transferred through conduction, convection and radiation (Physics Y8 heating and cooling)	Students should be familiar with the ideas of materials having different properties and states of matter. (Properties and changes of materials KS2 NC) Students should be able to explain the particulate nature of matter (Chemistry Y7 Particle model) Students should be able to explain the effects of energy on changes of state. (Chemistry Y7 Particle model)	Students should be familiar with standard circuit diagram symbols and the idea of using different component in circuits. (Physics KS2 NC) Students should be familiar with the terms current, voltage and resistance and the relationship V=IR. (Physics Y7 voltage and resistance and current) Students should be able to explain how current changes in series and parallel circuits when components (Physics Y7 voltage and resistance and current)
What skills will pupils	Students will know that a magnet has a North and South pole, and that like	Students will develop experimental skills including, forming	Understanding the wave model will allow students to predict the amount of	Students will be able to explain that waves transfer energy when	Students will be able to identify energy stores and energy transfers in a	Students will be able to explain the particulate nature of materials. This will support them when they	Students will be able to explain the behaviours and calculate different quantities in a range of

learn and apply? **(disciplinary knowledge)**	poles will repel and opposite poles will attract, they can use the knowledge of opposites attract in other areas of science. Students will be able to plot field lines practically to be able to represent the strength and direction of a magnetic field at KS4 using plotting compass or iron filings. Students will make predictions based on their scientific knowledge. Students will know that only iron, nickel, cobalt and objects containing these metals are magnetic, but that other magnets and current carrying wires also interact with a magnetic field.	hypothesis, carrying out a fair test and drawing conclusions. Students will know how an electromagnet is made and why it can be more useful than a permanent magnet.	energy transferred by a wave according to the frequency and amplitude of the wave and in KS4 calculate the energy transferred Comparing transverse and longitudinal waves will allow students to predict how they will be affected by the material they pass through. An understanding of the frequency of waves will help students explain red shift as evidence of an expanding universe Investigating how waves combine will allow students to predict some outcomes of extreme events such as earthquakes and tsunami	particles vibrate in order to suggest how the size and frequency affects the amount of energy transferred and eventually calculate this energy at KS4 Students will have investigated how the energy from waves can affect cells in order to use this to explain the benefits and risks of using some EM waves and link this to the dangers of radioactive waste Students will be able to go on to evaluate the position of wave power generators for maximum energy production but minimum environmental impact which will help them understand the difficulties in positioning renewable energy generators This unit also links to music and design technology at KS4	range of systems. This will be referred to in further units as they continue to study science and is referred to in Biology (ecosystems and respiration) and Chemistry topics (chemical reactions.) The section on energy production and resources also links with the Chemistry theme of earth and atmosphere and is revisited through Y7, 8 and into GCSE. Students will learn to apply a number of equations in this section. This means that students will be able to apply generic skills for calculating any term in an equation and making a new subject the focus. Students will be able to interpret data from tables and graphs and form evaluations, this will be applied to skills such as renewable and non-renewable energy.	revisit properties of materials in Chemistry (structure and bonding, energy changes, viscosity) and Biology (cell transport – diffusion, osmosis and active transport) Students will learn to apply the density equation in this unit. This means that students will be able to apply generic skills for calculating any term in an equation and making a new subject the focus. Students will be able to convert units so they can convert into and out of SI units.	circuits. This will support them when they revisit electricity in Y10 and link to several of their required practicals. Students will learn to apply a number of equations in this section. This means that students will be able to apply generic skills for calculating any term in an equation and making a new subject the focus. Students will be able to convert units so they can convert into and out of SI units. Students can plot data so they can identify patterns in data and draw conclusion from graphs. Students will also be able to draw accurate lines of best fit so that they can describe and explain graphs. Students will know the risks involved with mains electricity, this will allow them to work safely in a science lab and at home. This also links with the Chemistry theme of reactions, specifically when electrical circuits are used to separate substances through electrolysis.
Key vocabulary pupil will know and learn	Magnet Magnetic field Attract Repel	Electromagnet Core Permanent Induced	Transverse wave Perpendicular Longitudinal Superposition	Frequency Hertz Echo Auditory range	System Conservation Efficiency Dissipation Renewable Finite	State Particle Density Latent heat	Current Voltage Resistance Component Circuit
How will pupil understanding be checked &/or assessed?	Each school in the Trust follows the same assessment cycle process. All students will complete an informal key piece assessment every half term (at least) which take a variety of formats to assess golden knowledge learnt over the previous lessons. The key piece assessments are either retrieval-based questions to help students retrieve their prior golden knowledge, scientific literacy questions where students have to practice applying their golden knowledge to exam style questions in different contexts or exam style questions using a variety of command words such as describe, explain and evaluate. Students will then complete a short improvement activity based on gaps identified in the informal key piece and teachers will check these to ensure gaps have closed. In addition to these informal key piece assessments, all students complete a formal assessment at least every term which synoptically assess their retention and application of key golden knowledge learnt in Biology, Chemistry and Physics. Teachers will then use the Science Trust QLA tracker to identify gaps in knowledge; reteach accordingly and then students will complete a range of improvement style activities to close those gaps which are then checked by the teacher either through live marking or collection of books. Further details of the Science SHARE Assessment and Feedback policy can be found here: Q of E						

Resources available	Each school has their own shared area for each year group in each key stage. Lessons are planned to follow the SHARE Science lesson structure guidance document which can be found here: SCIENCE SHARE MAT lesson structure guidance.docx In summary: 1. First 5/Do Now to retrieve prior learning needed for the foundations of new learning. 2. I do/explicit instruction/guided explanation/teacher input through expert curriculum delivery. 3. We do/modelling where appropriate to show students how to remember and apply the key golden knowledge to different contexts. 4. You do/Independent practice to retrieve and practice applying the key golden knowledge to a variety of contexts. 5. Final 5 to retrieve key golden knowledge learnt in the lesson. All schools have these SHARE Science curriculum plans, delivery plans which sit underneath these to guide staff on when to deliver each section of the curriculum and then schemes of learning and lesson resource folders to adapt in order to meet the unique needs of the students and classes they teach. All shared resources which are common across all schools can be found in the SHARE Science folder here: Home (click on the documents tab at the top of the page) All QA including lesson visits, work scrutiny and student voice will prioritise the SHARE Science Q of E Non-Negotiables Checklist which can be found here: SCIENCE SHARE MAT Non negotiables Q of E QA check list.docx All lesson resources are focussed on retrieval (through the Retrieve to Remember strategy) and practice, and this is built into these curriculum plan through effective sequencing of golden knowledge components. There are also KS3 and KS4 Golden Knowledge booklets for staff which outline the key golden knowledge linked to the exam specifications and National Curriculum at KS3 and KS4. These can be found here: Golden Knowledge If staff can't get access to any of the folders above, please request access through joanna.richards@sharemat.co.uk						
Notes **Why this topic is important …**	This topic is fundamental at building the groundwork to understanding magnetism. This topic will be revisited and developed in magnets and electromagnetism topic at KS4.	This topic introduces the effect of a current carrying wire generating a magnetic field. This is important knowledge students need in order to be able to access the motor effect and generator effect in future study at KS4. For students accessing triple study, this will also be essential to access transformers and loudspeakers.	An understanding of how waves transfer energy will allow students to make judgements about the risks and benefits of different sources in medicine and health	This topic is important because it builds foundation on understanding how waves travel. This will be revisited and built upon in the Physics waves topic in KS4	Energy is a fundamental aspect of Science. Nothing in the world happens without an energy transfer but the amount of energy in the universe is fixed as energy cannot be created or destroyed. This builds on the ideas of energy taught in Y7 and Y8. It underpins each module taught in physics as it embeds the idea of energy being transferred and stored in a variety of circumstances. The idea of energy transfer is also central to the ideas of chemical reactions in Chemistry and the transfer of energy in ecosystems and within organisms (interdependence and ecosystems.)	This topic underpins several aspects of chemistry and starts students in understanding the basics of materials science; how structure affects properties. It allows them to explain every day experiences and to start to make informed choices about material suitable for their applications. This builds on the ideas of matter taught at KS2 and prepares students for bonding and properties in Chemistry at GCSE.	Electricity is a fundamental aspect of Physics and in students' every day lives. They can understand from this how and why electrical equipment works and how it can be designed. This builds on the ideas of electricity taught at KS2 and in Y7 and Y8 (current and voltage and resistance and prepares students for applications of electricity in Chemistry and later in Physics (electromagnets, motors and generators.)