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Curriculum Planning Template

Subject: Physics	Year 8	Ability

Term / Date(s)

Topic	Contact Forces	Pressure	Work	Heating and Cooling	Magnetism	Electromagnetism	Wave properties	Wave effects
Topic overview Students will learn…	The effects of forces on objects	About pressure in solids, liquid and gases	How forces moving on an object is the work done.	The effect of mass and temperature on an objects thermal energy	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
What Golden Knowledge will pupils learn and remember?	Students will be able to understand the difference between a contact and non-contact force in order to identify a force as contact or non-contact. Students will know that forces are pushes and pulls and are measured in Newtons in order to calculate the overall force. Students will be able to identify if a situation is in equilibrium or not in order to be able to identify resultant forces. Students will be able to identify when forces on an object are not balanced in order to be able to describe that this causes acceleration or direction change. Students will be able to describe that when forces are in equilibrium objects will remain stationary or at constant speed in a straight line in order to be able to describe what happens when there is a resultant force.	Students will use the equation Pressure = Force / Area in order to perform pressure calculations. Students will understand the relationship between an objects weight and upthrust in order to be able to explain why objects float or sink. Students will be able to explain that the effect of a force can be changed by the area upon which it is acting in order to describe the effect of pressure in different circumstances. Students will use the idea of pressure changing with depth in order to explain underwater affects Students will be able to describe atmospheric pressure in order to link it to the weight of the air above the surface. Students will be able to use the idea of stress to predict potential damage to one solid by another.	Students will know how the work done in a system is dependent on the force used to move an object and the distance it is moved in order to perform work done calculations. Students will know the law for the conservation of energy and be able to apply it to a physical reaction. Students will be able to describe the basic components of a lever in order to apply this to uses in the industry. Students will be able to identify the advantages and disadvantages of different levers in order to compare	Students will observe how heat is transferred through different materials in order to link the rate of transfer to the material it is made of Students will understand that when an object is heated to increase its temperature the time it takes depends on the material used and the mass of material in order to compare the energy needed to increase the temperature of different materials. Students will understand how heat can be transferred through particles by conduction in order to be able to relate	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 of a magnetic field changes with distance.	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 permanent magnet for a device, this will enable them to critique device designs and suggest improvements.	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 order to	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

	Students will know that forces can affect objects by changing their shape in order to be able to apply this to the extension of a spring and the effects of pressure. Students will be able to describe how the amount of deformation an object undergoes relates to the force it experiences in order to be able to later relate this to the area over which this force is applied and identify this as pressure. Students will be able to describe the factors that affect the size of frictional and drag forces in order to be able to explain how these forces have an effect on moving objects and their stopping distances. Students will be able to describe the effects of drag on falling objects in order to describe how these forces compare to the force of gravity and terminal velocity. Students will be able to describe the relationship between the extension of a spring and the force applied in order to be able to describe and calculate Hooke's Law at GCSE. Students will develop the idea of proportionality between force and extension of a spring. This is in order to be able to use this description to describe the relationship between other values throughout science. Students will be able to describe methods of reducing the effect of drag forces in order to be able to evaluate the effectiveness of different technologies at reducing this. Students will apply this knowledge to vehicles and	Students will be able to describe different stresses on a solid object which can be used to explain observations where objects scratch, sink into or break surfaces. Students will be able to carry out calculations involving pressure, force and area in hydraulics in order to see the effects of increased applied forces.	the forces needed in different circumstances.	this to the particle model in solids Students will observe convection in liquids and use these to explain heat transfer by convection in order to be able to illustrate convection currents in unfamiliar situations Students investigate heat loss through radiation, comparing black and silver surfaces, in order to be able to explain that particles are not always needed to transfer energy Students will be able to compare and contrast how energy is transferred through conduction, convection and radiation in order to be able to suggest which method of transfer is most likely in a given situation	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.	Students will be able to describe how devices using electromagnets work in order to link this to how bells, circuit breakers and loudspeakers work.	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	energy and be able to explain how frequency and amplitude affect the 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

	stopping distances in the speed topic. Students will be able to describe how turning forces are used in levers to multiply force and use a simple formula to calculate this affect.							
What prior knowledge should pupils already know?	Students should be able to identify that forces can act on objects to change its shape (KS1 NC - Forces and Magnets) Students should be able to identify the effect of friction (KS2 NC- Forces) Students should have experience of observing objects moving due to a force applied to them. (KS2 NC- Forces) Students should be able to describe that an unsupported object will accelerate towards the ground due to the force of gravity. (KS3 – Year 7 Forces – speed topic)	Students should be able to draw a force diagrams to describe the forces acting on an object. They should be able to identify if these forces are in equilibrium and that if they are not they cause objects to accelerate or change shape. (KS3 Motion and forces Year 8 Contact forces) Students should be able to identify a range of contact and non-contact forces acting on objects in different situations. (KS3 – Year 7 Forces – speed topic) Students should know forces are measured in Newtons using a Newton-meter. (KS3 – Year 7 Forces – speed topic) Students should be aware of the particle model of liquids, solids and gases and how particles behave in each of these states. (Year 7 KS3 particle model)	Students should know that forces cause objects to move and that an object can experience drag forces. (KS3 – Year 8 contact forces) Students should be able to identify the effects of air resistance, water resistance and friction, that act between moving surfaces. (KS2 NC – Forces, KS3 – Forces) Students should know that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect. (KS2 NC – Forces) Students should be able to explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object. (KS2 NC – Forces, KS3 Year 7 Forces topic)	Students should be able to make systematic and careful observations and take accurate measurements using appropriate equipment such as thermometers and data loggers (KS2 NC – working scientifically, KS3 Year 7 Changes of state ad separating mixtures (pure and impure substances) They can collect data from their own observations and measurements (working scientifically NC KS2 to KS3) Students should be able to group materials based on properties such as thermal conductivity. (KS1 – NC everyday materials and their physical properties, KS2 NC states of matter)	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	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)

						force. (KS2 NC Forces and magnets)		
What skills will pupils learn and apply? (disciplinary knowledge)	The ability to identify forces acting in systems. Be able to identify and describe the effects of forces on objects such as causing an acceleration, change in direction or change in shape. Students will understand the concept of proportional relationships between 2 values which will enable the students to identify and describe this relationship in a variety of other settings, such as force and acceleration.	The ability to draw qualitative conclusions from practical observations. Students will understand how to use simple formula to calculate an unknown quantity. Students will learn that scientific formula only work when using specific units and will begin to learn how to convert these, this will be valuable throughout this Big Idea and wider in science.	Students will be able to describe the work done in a range of familiar and unfamiliar processes as energy transfers from one energy store to another. Students will be able to use this knowledge of energy transfer and be able to use this when describing transfers between energy stores and pathway system at KS4 energy Knowing how to calculate changes in energy and apply this to calculating the work done on an object links to calculations in physics Energy topic at GCSE and moments at GCSE forces and motion Combined higher and Separate science physics Understanding how levers work and using this to explain moments in a system will allow students to explain the balance between moments at GCSE. An understanding of how to compare the advantages and	Students will be able to compare heat transfer through different materials in order to be able to explain why metals are suitable for cooking pans whereas wood is better for pan handles Students will be able to use their knowledge on how heat is transferred in liquids and solids will allow them to explain movements within the rock cycle and tectonic plates and how houses are heated through radiators and air particles in a room Understanding how the density of materials changes creating convection currents will allow students to explain how hot air balloons rise and weather features can develop Evaluating heat transfer methods will allow students to understand why silver blankets are put around long distance runners and accident victims to maintain body temperature as well as being able to explain some animal adaptations in hot and cold climates	Students will know that a magnet has a North and South pole, and that like 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.	Students will develop experimental skills including, forming 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.	Understanding the wave model will allow students to predict the amount of 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	Students will be able to explain that waves transfer energy when 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

			disadvantages of using levers, in terms of the force needed and the distance moved will allow students to compare the energy requirements of a system.	Investigating heat loss through radiation will allow students to explain some of the main concerns around climate change and loss of ice caps. Evaluating data from manufacturers will allow students to make judgements based on scientific evidence and express them in a logical way to different audiences				energy generators This unit also links to music and design technology at KS4
Key vocabulary students will know and learn	Equilibrium Deformation Compression Resultant Balanced	Fluid Pressure Upthrust Atmospheric pressure Stresses Hydraulics	Work done Lever Joule Conservation	Thermal Conductor Insulator conduction convection Radiation	Magnet Magnetic field Attract Repel	Electromagnet Core Permanent Induced	Transverse wave Perpendicular Longitudinal Superposition	Frequency Hertz Echo Auditory range
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…	Students will understand the definition of equilibrium which will be revisited during the rates of reaction topic in chemistry KS4 and homeostasis biology KS4. Students will discuss the drag forces of air resistance and friction and what affects their size. Students will use this knowledge to explain what forces resist a moving object and limit its speed and how these can affect stopping distances at GCSE Students will be able to identify a range of contact forces and use force diagrams to represent their size and direction and identify resultant forces in the forces topic at KS4	Students will be introduced to using equations and formula to calculate missing values which will allow students to access more easily these in future topics at KS4 Students will begin to understand that the size of the force isn't necessarily the only thing that changes the affect it has on an object. This will further be developed when studying moments in Higher combined science or Physics GCSE.	This topic is important because students will learn the fundamentals of work done which will give them a good understanding of how to calculate work done which will be revisited and built on in the energy topic in KS4.	This topic introduces heat as a way energy can be transferred through a substance or from one to another, along a temperature gradient. This is one of the key ideas that underpins many scientific topics such as earth science, materials science, bonding and animal adaptations By investigating ways that heat can be transferred students will be linking knowledge from the particle model, materials science and earth science to be able to see how all of the topics are linked by the same fundamental processes. Reducing heat loss is important now to reduce the effects of climate change and investigating how this can be achieved will allow students to make reasoned arguments for changes in the way we live Planning and carrying out	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

				investigations to present valid data will reinforce the importance of the scientific method and allow students to identify questionable claims for products that are not based on evidence				