

Subject:	Physics	Year 8	Ability
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Term / Date(s)

Topic	Sound	Light	Contact Forces	Pressure	Work	Heating and Cooling
Topic overview	that sound travels as a wave and how changing pitch and volume change a wave.	how light passes through, reflects back from or is refracted by different materials	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
Students will learn...						
What Golden Knowledge will pupils learn and remember?	Students will be able to understand sound in order to describe it as a longitudinal wave that travels through substances. Students will be able to use drawings in order to explain how to change the amplitude and pitch or volume of a sound wave Students will be able to interpret a wave form from an oscilloscope or diagram in order to describe the amplitude and frequency Students will carry out investigations to observe how sound is transferred, absorbed or reflected by different mediums and therefore be able to explain why is will not	Students will be able to describe how light travels from a source to our eyes in order to be able to interpret ray diagrams Students will be able to use ray diagrams of eclipses in order to describe what is seen by observers in different places. Students will know that light intensity is reduced with distance from the source in order to be able to explain why distant stars are less bright Students will be able to explain that light travels in straight lines in order to use experiments to demonstrate this Students will be able to explain what	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	Students will use the equation $\text{Pressure} = \text{Force} / \text{Area}$ 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 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	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

	travel through a vacuum Students will investigate what sounds they can hear and use this to explain the benefits for different organisms being able to hear different ranges of sound Students will investigate the structure and function of the ear in order to consider the effects of ear problems on hearing Students will plan and carry out an investigation into an aspect of hearing in order to present their findings to others	happens during reflection from a plane surface and use this to predict where to place mirrors to move light around a corner Students will be able to accurately draw and label the incident and reflected ray of light and calculate the angle of reflection to predict the path a ray would take Students will be able to use ray diagrams to show how light is refracted by transparent media and from this explain how lenses can be used to correct faulty vision Students will be able to explain why different coloured lights change the perceived colour of different objects and use their knowledge of wave frequency to explain this. Students will be able to use ray diagrams in order to predict how a ray of light will be reflected, refracted or dispersed from any given material such as lenses	constant speed in a straight line in order to be able to describe what happens when there is a resultant force. 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	Students will be able to use the idea of stress to predict potential damage to one solid by another. 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 advantages and disadvantages of different levers in order to compare the forces needed in different circumstances.	through particles by conduction in order to be able to relate 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
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What prior knowledge should pupils already know?	Students will know how to identify how sounds are made, associating some of them with something vibrating (KS2 NC: Sound) Students will be able to recognise that vibrations from sounds travel through a medium to the ear (KS2 NC: Sound) Students will have found patterns between the pitch of a sound and features of the object that produced it. They will also have found patterns between the volume of a sound and the strength of the vibrations that produced it (KS2 NC: Sound)	Students will be able to recognise that light appears to travel in straight lines (KS2 NC: Light) Students will be able to explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes (KS2 NC: Light) Students will have used the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them (KS2 NC: Light)	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	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 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 will recognise that sounds get fainter as the distance from the sound source increases (KS2 NC: Sound)			and how particles behave in each of these states. (Year 7 KS3 particle model)	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 group materials based on properties such as thermal conductivity. (KS1 – NC everyday materials and their physical properties, KS2 NC states of matter)
What skills will pupils learn and apply? (disciplinary knowledge)	Students will know the wave characteristics of a longitudinal wave and be able to identify the wavelength and frequency on a wave diagram Students will understand that waves can be reflected, transmitted or absorbed depending on the material they are passing through	Students will be able to draw and interpret ray diagrams to explain how light reacts with different media Students will understand how different frequencies of light are absorbed or reflected to help explain why some substances reflect or absorb heat and plants appear green. Students will understand why light is refracted and so explain how lenses are used to correct eyesight problems	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	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

					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 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.	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 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
Key vocabulary students will know and learn	Vibration Longitudinal Transverse Amplitude Frequency Wavelength	Incident ray Reflected ray Normal line Refraction Absorption Scattering	Equilibrium Deformation Compression Resultant Balanced	Fluid Pressure Upthrust Atmospheric pressure Stresses Hydraulics	Work done Lever Joule Conservation	Thermal Conductor Insulator conduction convection Radiation
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 develop the idea that waves are a method of transferring energy, in this case as sound. Understanding how they pass more easily through some substances will allow students to begin to understand the differences between states of matter Being able to identify the features of waves will help students understand how transverse waves can	Students will develop their understanding of how waves transfer energy and constructing ray diagrams will allow them to predict the pathway through different media Accurate drawing of ray diagrams will allow students to progress to calculation of focal length at KS4 in Physics and therefore predict the best corrective lenses for a vision defect	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 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

	vary and so perform calculations in KS4 Investigating some ways hearing can be affected will allow students to make healthy lifestyle choices Students will also be able to link this topic to units in music for the nature of sound and in ICT when evaluating the effectiveness of sound cancelling devices.		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			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 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
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