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Curriculum Planning Template

Subject: Science (Physics) Year 11 Ability ALL

Topic	6.6 Waves 4.6 Waves (physics only)	6.7 Magnetism and electromagnetism 4.7 Physics only	4.8 Space Physics. (Physic only)
Topic overview Students will learn…	to describe, with examples, the behaviour and properties of transverse and longitudinal waves. to explain the properties of sound waves and the uses of waves. to explain what happens to waves at the boundary between two different media. to explain the types and properties of electromagnetic waves.	to describe the interaction of magnets on each other, magnetic materials and electromagnetic fields. HT: to explain the applications of electromagnetism. to describe and explain how magnets are used in common objects such as electric motors.	identify components of the solar system. explain the life cycle of sun-like stars and giant stars. describe orbital motion of natural and artificial satellites. use evidence to support the big bang theory.
What Golden Knowledge will pupils learn and remember?	Students can identify longitudinal and transverse waves from diagram and can compare their structure, allowing them to explain how waves transfer energy. Students can label and describe the key features of these waves. This will allow them to explain how the properties of the wave changes as these features change. Students should be able to calculate period from frequency and recall and apply the wave speed equation, to allow them to quantify the properties of waves. Students will complete an RP to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid. Students can carry out and RP to investigate the reflection of light by different materials. Students can state order of EM spectrum and describe properties of each wave and give examples which will allow them to explain their suitability for different	Students will be able to identify the poles on the magnet and describe and draw a magnetic field which will allow them to identify where on a magnet the magnetic field is the strongest and weakest allowing them explain how compasses work. Students will be able to explain how the behaviour of a magnetic compass is related to evidence the core is magnetic. Students will learn what a solenoid is which will enable them to explain how an electromagnet works and where electromagnets are used. Students will be able to describe how the magnetic field of a current can be demonstrated and draw the resulting magnetic field, allowing them to compare magnets and electromagnets. HT: students will be able to describe Fleming's Left Hand Rule in order to workout which way force is acting on a conductor due to the motor effect. Students will be able to recall and apply F = BIL which will allow them to calculate the size of the force acing on a conductor Students will able to explain how the force on a conductor in a magnetic field causes rotation of the coil in an electric motor which will allow	Students will recap the components of our solar system including natural satellites and moons and explain this is a small part of the milky way galaxy. Students will be able to explain how the sun was formed. Students can explain how fusion reactions lead to an equilibrium and therefore a stable main sequence star Students can describe the life cycle of sun like stars and stars that are larger than the sun. This will enable students to make predictions on likely lifecycles of stars based on relative size. Students can compare planets, moons and artificial satellites in terms of orbits. HT: students will be able to explain qualitatively how gravity can change velocity but not speed and for a stable orbit the radius must change if the speed changes. Students can explain red shift in terms of wavelength and use this as part of the evidence to support the ideas of the expanding universe and the big bang.

	uses. Students should be able to state the practical uses of different EM waves. HT: explain the behaviour of waves at interfaces with different substances according to their wavelength and velocity. (reflection, transmission and refraction.) Students will complete an RP to investigate the amount of infra-red radiation absorbed or radiated by different surfaces depends on the nature of that surface. This will allow them to explain the use of different surfaces for different applications. HT: explain that radio waves can be produced by oscillations in electrical circuits. Students will be able to explain the spectrum of light within visible light. They will be able to explain the effect of coloured filters and describe the behaviours of different materials in terms of opacity and transparency. Students will be able to explain the concept of black body radiation and apply this to the temperature of the earth.	students to develop an understanding of how electric motors are used in things like washing machines, electric cars, hair dryers, CD players. Students will be able to explain how a solenoid arrangement can increase the magnetic effect of the current which will help students to explain how a loudspeaker, headphones and microphones work. HT: Students should be able to explain the concept of induced potential name the factors that affect the size of the force on the conductor. They should also be able to explain the factors which affect the direction of the ppd. This will allow them to apply the principles of the generator effect in a given context. HT: Students able to explain how the generator effect is used in an alternator to generate AC and in a dynamo to generate DC. They should also be able to link this to how microphones. HT: students will be able to explain the use of transformers in the national grid and complete calculations to quantitatively explain their effects.	Students can describe how scientists make observations to support theories.
What prior knowledge should pupils already know?	Students should be familiar with the idea of light and reflection and refraction (KS2 NC Y6 Light, Physics Y8 wave properties) Students should know the features of waveforms and the differences between transverse and longitudinal waves. (Physics Y7 sound and light topics) Students should understand the idea that waves transfer energy and not matter. (Physics Y8 wave effects) Students should also be familiar with the idea of gamma as a form of EM radiation from when they study atomic structure (Physics Y10 atomic structure)	Students able to identify contact and non-contact forces, students able to recall that like poles on a bar magnet repel and opposite poles attract. (KS2 NC Y3 forces and magnets, Physics Y8 magnets and electromagnets) Students are able to describe how to “see” a magnetic field using plotting compasses and iron fillings. (Physics Y8 magnets and electromagnets) Students able to recall that magnetic fields strongest at poles. Students able to describe how to change the strength of an electromagnet. (Physics Y8 electromagnets) Students able to recall that a current flowing through a wire produces a magnetic field. (Physics Y8 electromagnets) Students might be able to describe how a loudspeaker works. (Physics Y8 electromagnets) Students will be familiar with the concepts of current and flow/transfer of energy in conductors. (KS2 NC Y4 electricity, Physics Y7 current and voltage and Y9 Physics electricity)	Students can state the difference between artificial and natural satellites Students can name the planets in the solar system and explain the motion relationships. (KS2 NC Y5 earth and space) Students should be familiar with the idea of gravity acting on objects in space. (KS2 NC Y5 Forces) Students should know how the earth fits into the solar system and the universe. They should be able to use this to explain choice of units appropriate for scale and the changes in day lengths and seasons. (Chemistry Y8 universe.) Students should be familiar with the ideas of atoms and isotopes and atomic structure. (KS3 chemistry matter theme and atomic structure in both Y9 physics and chemistry.)
What skills will pupils learn and apply? (disciplinary knowledge)	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 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 learn to use to use appropriate units for scale and convert between these units.

	Students will be able to interpret data from tables and graphs and form evaluations. Students will be able to write methods for the required practicals in this topic which transfers across to all other aspects of science. There is also a crossover between this and physics atomic structure where they learn that gamma is a type of ionising radiation.	Students will apply their understanding of forces from Y11 forces topic.	This unit uses some knowledge of atoms and isotopes from previous chemistry units. Students should be able to draw conclusions from data – graphs and tables.
Key vocabulary pupil will know and learn	amplitude wavelength frequency longitudinal transverse	solenoid fleming's left hand magnetic field strength magnetic flux density transformer split ring commutator	nebula orbit fusion reaction gravitational collapse red shift doppler effect
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…	Waves links to the fundamental concept of energy transfer and they have explored this in energy and waves topics through science in KS3 and early KS4. This unit focuses on real world applications of these waves. The topic links to 4.8 Space Physics in terms of the Doppler effect and Red-shift. It links to 6.7 and a perfect black body. It links to 6.4 and gamma radiation which is part of the electromagnetic spectrum and is a type of ionising radiation.	This is a further unit which explores how Physics is used in everyday life for electricity generation and in motors. This links to electrical power generation in Y9 energy. Electromagnetism also links to 6.6 (4.6) electromagnetic waves.	This is usually the last unit taught in GCSE for Triple Physics and as such doesn't directly feed into other units, instead bring concept from different units into the context of space. Atomic structure (Unit 4.4) Students have learnt about nuclear fusion and fission in unit 4 and this units puts this in a different context. They will also link this to their knowledge of atomic structure more broadly from chemistry from ks3 and unit 5.1. (4.1). This unit prepares students for some units in A level physics including the optional unit of Astrophysics.