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Curriculum Planning Template

Subject: Science (Physics) Year 10 Ability ALL

Topic	6.4 Atomic structure. 4.4 Atomic structure (physics only)	Energy and Electricity review	6.5 Forces 4.5 Forces (physics only)
Topic overview Students will learn…	to recognise the different historical models of the atom and understand how the model has changed overtime. (crossover content with chemistry unit atomic structure) to describe the currently accepted model of the atom to describe nuclear radiation, its uses and management. to quantify nuclear decay and explain how nuclear fission and fusion work.	will revisit the aspects of energy and electricity taught in Y9 and to extend beyond the national curriculum content to include the aspects required only for GCSE. Students will arrive at this unit having covered the majority of this before, now looking at applying it to required practicals with extended maths skills and to real life examples/exam questions and alternative contexts. 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. to interpret and construct circuit diagrams. to explain the different types of circuits and components and their effects on circuit behaviours.	to categorise forces and apply Newton's laws. to describe both quantitatively and qualitatively motion in a line. to apply a range of formulas in various scenarios. to calculate momentum and apply conservation of momentum (HT).
What Golden Knowledge will pupils learn and remember?	Students will be able to describe how an atom is structured so they can explain why some nuclei are unstable and emit radiation. Students understand how the structure of the atom was developed through experimental work so they can identify the process off how new experimental work can lead to the development of new ideas in science over time. (crossover content with Chemistry) Students will be able to name the 4 types of radiation, describe their structure and properties. They will then be able to explain how this matches to their uses. Students will know that elements decay at different rates and that this is random. Students will be able to calculate half -life as a prediction of decay so they can	Students will be able to recall the 8 energy stores and 4 energy transfers and apply these to a range of situations and systems. 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. Students will be able to explain the concept of specific heat capacity (SHC) and calculate it using the equation. They will use this knowledge to complete an RP to determine the specific heat capacity of one or more materials. They will present this data in a graph and calculate the gradient to find the SHC. Students will review the different circuit symbols and use them to accurately draw and interpret circuit diagrams.	Students will be able to describe and give examples of scalar and vector quantities. Students will be able to explain the difference between mass and gravity with correct units. This will help students identify the difference between a vector and scalar quantity in context. Students will be able to draw scaled diagrams to resolve forces acting in a straight line to enable them to describe the resulting motion of an object. HT – will be able to use vector diagrams to illustrate the resolution of forces acting at right angles to each other to enable them to calculate the resultant in terms of magnitude and direction and to describe the resulting motion of an object.

	understand how this is useful to scientists when calculating events timelines. Students will be able to solve nuclear decay equations. Students will know how irradiation and contamination differ so appropriate precautions can be taken. Students will be able to describe the causes of background radiation so they can explain why is differs according to occupation and location. Students will be able to explain the hazards and uses of radioisotopes with different half lives. Students will be able to describe nuclear fusion and how this is linked to stars. Students will be able to describe nuclear fission and evaluate its uses as an energy resource.	Students will learn to apply a number of electricity equations, this will allow them to quantify the effects of electrical components. Students will recall the relationship between potential difference, current and resistance. This will allow them to explain how resistance can change in various components and length of wire. They will also recall the differences between series and parallel circuits. They will complete an RP investigating the factors affecting the resistance of a circuit: the length of a wire and combinations of resistors in series and parallel. Students will review the resistance of different components. They will complete an RP investigating the I-V characteristics of different components. They will learn to recognise the IV graphs for these components and use these to explain how their resistance changes. This will allow them to explain how a circuit would work or to choose the correct components for a particular application. Note: students will have encountered the energy and electricity equations before but not learnt them only applied them. They need to learn them here as these are recall and apply equations for the most part.	Students will be able to explain the forces involved in the stretching or compressing of an object. They will be able to apply the F=ke equation. They will carry out RP on Hooke's law which will allow them to see forces in action and practise calculating the gradient of graphs. HT: Students will be able to calculate and apply moments. This can be used to explain how levers work and how common devices are made more effective. This knowledge will also link in with mechanics and engineering. Students will be able to define pressure, calculate pressure at different depths of a liquid. This will allow students to understand how pressure changes in oceans and other systems. Students will be able to describe relationship between atmospheric pressure and altitude. Students will be used to explain how pressures changes at different elevations. Students will be able to calculate speed/velocity, distance travelled, acceleration from equations and graphs. Students will be able to use distance time graphs and speed time graphs to calculate speed, acceleration and distance travelled. This will allow them to interpret these graphs to describe the motion of an object through a journey. Students should be able to recall and apply Newton's laws. Students will be able to recall and use newtons laws to explain real-life situations. Students will be able to explain the forces associated with a braking vehicle and define stopping distance. This will enable them to identify and explain the factors affecting thinking and stopping distance as well as the concept of reaction time. HT: students will be able to explain that momentum if a property of a moving object and be able to calculate it using the equation momentum = mass x velocity. They will use this to be able to predict and calculate the motion of objects after a collision or explosion using the principal of the conservation of momentum. Students will be able to explain the concept of change in momentum and use this to explain common safety features such as air bags, seat belts and crash mats.
What prior knowledge should pupils already know?	Students will know the nuclear model of the atom. (Chemistry atomic structure Y9)	Students should be familiar with the term energy stores and transfers. (Physics Y7 energy transfer)	Students will be able to give examples of contact and non-contact forces and describe the effects of forces. (KS2 NC Y3 forces and magnets, Physics Y8 contact forces)

	Students will know about the alpha scattering experiment and the changing models of the atom. (Chemistry Y9 atomic structure) Students will know that nuclear energy is an energy store. (Physics Y9 Energy) Students will know about the solar system. (KS2 Earth and space (Y5), KS3 Physics Y8 Universe)	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 will be familiar with the energy stores and pathways. They should be able to apply equations to calculate energy and work done. (Energy Y9) Students should be familiar with standard circuit diagram symbols and the idea of using different component in circuits. (Physics KS2 NC, Electricity Y9) Students should be familiar with the terms current, voltage and resistance and the relationship V=IR. (Physics Y7 voltage and resistance and current, Electricity Y9).) Students should be able to explain how current changes in series and parallel circuits when components (Physics Y7 voltage and resistance and current, Electricity Y9). Students should know the circuit symbols, key electricity terminology, the relationships Q=it and V=IR, the rules of series and parallel circuits and the main aspects of mains electricity. (Electricity Y9).	Students will be able to interpret free body diagrams and calculate resultant force. (Physics Y8 contact forces) Students will be able to calculate pressure in solids, liquids and gasses (Physics Y8 pressure) Students will be able to distinguish between mass and weight, calculation of weight (KS2 Y5 forces, Physics Y7 gravity) Students should know that work done is a measure of energy transfer calculated by W = Fs. (Physics Y9 energy) Students will be able to describe energy transfers. (Physics Y9 energy) Students will be able calculate speed, interpret distance-time graphs (Physics Y7 contact forces) Students will be able be able to convert units and measure angles. (maths and previous physics units)
What skills will pupils learn and apply? (disciplinary knowledge)	Students will be able be able to interpret data from tables and graphs and form evaluations. They will also be able to calculate gradients and rates over time which links to Physics Forces and Chemistry rates of reaction. The balancing of nuclear equations reinforces the ideas of balancing equations which is explored throughout Biology, Chemistry and Physics from KS3 to KS5. Students will be able to relate properties of a material to a specific application. Students will be able to convert between units.	Students will be able to identify energy stores and energy transfers in a 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.) 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 will be able be able to interpret data from tables and graphs and form evaluations. 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. Building circuits also links with the Chemistry theme of reactions, specifically when electrical circuits are used to separate substances through electrolysis.	Students will be able to plan and record experiments. This will link in all aspects of biology, chemistry and physics. There are a large number of maths skills in this unit which prepares students for further study of Physics at A level or mechanics/engineering at KS5 or university level: Students will be able draw tangents. Enabling them to calculate range at specific points rather than the overall range of values. Students will be able to calculate the gradient. This will allow students to know the rate of change over time which links to Physics particle model and Chemistry rates of reaction. Students will be able to translate information between graphs and numeric form. This will allow students to identify patterns of data more quickly. 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 calculate the mean. This will allow students to gather more accurate data. Students will be able to describe linear relationships. Students will be able convert units. Students will be able to use significant figures based on the data given.
Key vocabulary pupil will know and learn	Alpha radiation, Beta radiation, Gamma radiation nuclear decay half life Irradiation Fission fusion.	Specific heat capacity Power Component Series Parallel Diode	Vector Scalar Displacement Velocity stopping distance momentum
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 build on the use of nuclear energy as energy resource. Fusion and fission links to the life cycle of stars and the future search for new energy sources. There are also several crossovers here between other Physics and Chemistry units, reinforcing the idea that science doesn't always fit neatly into specialisms and that real life science is often a crossover of all 3. Nuclear radiation links with electromagnetic radiation in Waves and the EM spectrum (Physics Y11). It also links with Biology - 4.6 (4.6) mutations, cancer, evolution which include causes of cancer and how nuclear radiation can be used in medical treatments. Students can also understand a real world uses of science in that nuclear decay equations can be used to date things archeologically, medical physics, soke alarms and thickness detectors as well as nuclear power stations.	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. 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 unit builds on the ideas of energy taught in Y7, Y8 and Y9. 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 builds on the ideas of electricity taught at KS2 and in Y7, Y8 and Y9 (current and voltage and resistance and prepares students for applications of electricity in Chemistry and later in Physics (electromagnets, motors and generators.)	Forces is another fundamental aspect of science. Forces cause the transfer of energy without which nothing on earth happens or changes. (see energy notes). This unit builds on all the aspects of forces delivered through KS2 and KS3 and prepares students for studying physics or engineering at KS5 and beyond. The concept in this unit or among the more practical/tangible of the science specification and can easily be linked to real life examples to show how Physics underpins everything in their lives and how an understanding can help explain the world around them, both quantitatively and qualitatively. There are significant links to other topics in Forces and lots of ideas are brought together in this unit: Space physics – nuclear fusion – balanced forces, life cycle of a star Biology: Reaction times – homeostasis 4.6 Earth atmosphere – links to atmospheric pressure 6.1 (4.1) Energy – gravitational potential energy, energy transfer, elastic potential energy 6.3 (4.3) Particle model of matter – pressure, work done