Curriculum Planning KS4 Physics

Long Term Planning

Rationale

- Science is a fundamental part of our everyday lives. It helps to explain so much of the world around us and enables advances in many areas including health, communication, the environment, and leisure.
- Students in KS4 study physics for three hours per fortnight. Students in KS4 are placed in groups based on their ability. Pupils in Y9 to Y11 follow a bespoke curriculum based on the national curriculum.

Intent

- The aims of KS4 Science at The Market Weighton School are to allow pupils to find out more about the world around them, to develop an interest and understanding of natural phenomena.
- develop scientific knowledge and conceptual understanding through the specific disciplines of chemistry
- develop understanding of the nature, processes, and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future.

Pedagogical Methodology

- The KS4 physics curriculum is designed to suit the needs of all students at The Market Weighton school. Each topic has numeracy, literacy and practical activities designed to develop all students' knowledge and key skills.
- Every lesson incorporates metacognition strategies designed with the aim of developing students' long and short-term memory in relation to retrieving key scientific knowledge.

Scientific knowledge and conceptual understanding

The programmes of study describe a sequence of knowledge and concepts. While it is important that pupils make progress, it is also vitally important that they develop secure understanding of each key block of knowledge and concepts in order to progress to the next stage. Insecure, superficial understanding will not allow genuine progression: pupils may struggle at key points of transition (such as between primary and secondary school), build up serious misconceptions, and/or have significant difficulties in understanding higher-order content.

Pupils should be able to describe associated processes and key characteristics in common language, but they should also be familiar with, and use, technical terminology accurately and precisely. They should build up an extended specialist vocabulary. They should also apply their mathematical knowledge to their understanding of science, including collecting, presenting and analysing data. The social and economic implications of science are important but, generally, they are taught most appropriately within the wider school curriculum: teachers will wish to use different contexts to maximise their pupils' engagement with and motivation to study science.

Literacy and Spoken language

The quality and variety of language that pupils hear and speak are key factors in developing their scientific vocabulary and articulating scientific concepts clearly and precisely. They must be assisted in making their thinking clear, both to themselves and others, and teachers should ensure that pupils build secure foundations by using discussion to probe and remedy their misconceptions.

- We have prioritised "disciplinary literacy" across the curriculum and identified the words and phrases used typically in science.
- We have identified what it means to read, write and speak like an expert science.
- We explicitly teach the etymology and morphology of words.
- We seeking out literacy misconceptions held by students.
- We have identified what the key tier 2 and 3 vocabulary is that students need to memorise and understand to succeed in each topic.
- We are developing students' ability to read complex academic texts through the super curriculum.
- We are displaying words in the presentations and explain definitions whilst students take notes or complete tasks seeking out the definitions.
- We are breaking down writing tasks using scaffolds to make sure all students can access.
- We are combining writing instruction with reading.
- We are exploring links with the same words in other subjects.
- We are providing opportunities for structured talk to develop oracy skills.

Scaffolding up <u>not</u> differentiating down

Scaffolding refers to a method where teachers offer a particular kind of support to students as they learn and develop a new concept or skill. In the instructional scaffolding model, our teachers share new information or demonstrate how to solve a problem. The teacher then gradually steps back and lets students practice on their own. It also can involve group practice. The model of instructional scaffolding is also sometimes described as "I do. We do. You do." In other words, the teacher shows how something is done, then the class practices together and, finally, students work individually.

Assessment

- Every lesson has a prove task where students will complete an exam style question which will either be self, peer or teacher assessed.
- The end of each topic has a test which is made up of past GCSE exam questions on that topic. Students will receive feedback and have the opportunity to address key areas to improve on.
- All students complete mock exams at the end of year 9, 10 and midway through the year for year 11

Disadvantaged students.

All staff are expected to respond to the needs of our most disadvantaged students. Please check the tiers and intervene accordingly. In the first incidence everyone

should use Wave 1 Quality First Teaching: This emphasises high quality, inclusive teaching for all pupils in a class. High quality teaching that is challenging and well scaffolded will meet the individual needs of most children and young people including Focus First students and students with SEND. Using the Focus First strategy encourages a focus on pupils who most need our support first.

Prepare phase.

- Embedded routines waiting on corridor and meet and greet at classroom door
- Punctuality and attendance support.
- Identification of focus first pupil and seat in form room accordingly.
- Consistent Verbal praise, respect rewards and sanctions.
- Precise data collections to inform planning.
- High expectations of behaviour and work.

Purpose of the lesson.

- Objective and learning question driven lessons.
- Lessons broken down into ‘chunks’ to reduce strain on cognitive load.
- Planning the lesson that uncovers student’s previous knowledge.
- Differentiation and scaffolding of tasks.
- Individual needs are met.
- Embedded metacognition theory amongst teachers and students.

Presenting information.

- Range of presenting strategies, discussion, text, media.
- Expert subject knowledge.
- Targeting misconceptions early.
- Inclusive questioning.
- Modelling and scaffolding.
- Provide enthusiasm and passion for subjects.

Practice knowledge.

- Students encouraged/praised.
- Engrossed in learning / on task.
- Independent, paired and group work.
- Developing discussion and debate skills.
- Teachers sharing subject passion.
- Use of strategies to aid learning e.g. concrete examples, word banks etc.

Students prove their learning.

- Adapted assessment for learning to suit learner needs.
- Pace allows for a ‘no time wasted’ ethos.
- Development of reading, literacy, maths and communication skills.
- Use of strategies to aid learning e.g. concrete examples, word banks.

Students ponder learning.

- Peer and Self-assessment.
- Written and verbal feedback to target improvement areas. (Focus first student prioritise first)

- Ponder Plenaries. Quizzing to check learning.
- All students meet expected targets.
- In-lesson progress checking.
- Identification of progress gaps
- Clarify misconceptions.
- Students aware of own learning and EVALUATE learning.

More able students.

To provide highly able pupils with the degree of challenge that will allow them to flourish. By strategically building cognitive challenge into our teaching, pupils' learning expertise, their appetite for learning and their wellbeing will all improve.

Strategies that are used to

- Extension by resource- Using resources that are 'more challenging' than others. These include: workbooks with more complex text and/questions a tool or piece of equipment that requires more dexterity or technical expertise.
- Extension by work rate or pace - Highly Able students often think and work faster than their peers, and we need to take account of this. Those who are capable of working fast are encouraged to do so, without fear of having to complete more work than everyone else.
- Extension by dialogue - We use more difficult vocabulary and more complex language to extend More Able pupils. Challenge is extended by: effective discussion between teacher and pupil
- Extension by support - We plan our groups carefully also considering where more able students sit. Sometimes able pupils learn most productively together, sharing and extending their more developed thinking
- Extension by questioning – we ask questions that are more probing: Can you say a little more about that? Why do you think that?
- Extension by pupils owns questions – Extension tasks include students thinking about what questions they can pose others in the room.

Numeracy

In the Science Department we recognise the importance of Numeracy across the curriculum. For Science it would be impossible to learn, discover and share ideas and inventions without the use of Numeracy. All good scientists use these key skills on a daily basis.

- We create a positive and attractive environment that celebrates Numeracy within science.
- We ensure that all teaching staff are familiar with correct mathematical language, notation, conventions and techniques relating to science and encourage pupils to use these correctly
- We make sure Numeracy skills are taught consistently and systematically through and across the science curriculum. To facilitate this, teachers of science to refer and follow the TMWS Numeracy Policy 1.8.
- We are aware of appropriate expectations of pupils and difficulties that might be experienced with numeracy skills.
- We have Numeracy embedded throughout the science curriculum

- We communicate with the mathematics department to map out and link both curricula to ensure teachers of both subjects use correct terminology and have suitable expectations of ability and knowledge of students so that teachers are equipped to deal with numeracy issues in their subject both generically and specifically.
- We encourage after completing calculations, they should be asked to consider whether their answer is reasonable in the context of the question.
- We encourage students to show method working to discourage students from writing answers only and encourage them to show numerical working within the body of their work.
- We make sure that all learners should be helped using modelling to understand the method they are being asked to use or being taught - they are then more likely to be able to transfer this method and remember it rather than learning by rote.

Metacognitive Strategies

Research by the Education Endowment Foundation has found that metacognition is key to effective pupil learning: it can add up to seven months of additional learning, and improve the outcomes of disadvantaged learners. The strategies we are implementing in the science department are:

- We are actively trying to teach students metacognitive strategies, including how to plan, monitor, and evaluate their learning.
- We model our own thinking to help students develop their metacognitive and cognitive skills.
- We set an appropriate level of challenge to develop students' self-regulation and metacognition.
- We are actively trying to promote and develop metacognitive talk in the classroom;
- We are getting more students how to organise, and effectively manage their learning independently.
- We continue to use of Google Classroom for any students to catch up any missed work
- We use lessons for DIT covering parts of the topic that need readdressing.
- We encourage students in good homework habits and the use of Epraise
- We have good communication with parents using Epraise

Foundation Learning

Students in the foundation learning groups follow the KS3 curriculum which is bespoke adapted curriculum to suit each student's individual needs and is taught by a specialist SEND science specialist teacher. Students in the foundation learning group have the same opportunities for literacy, numeracy and practical opportunities as students in mainstream education.

Sequencing the content

Working from the The Best Evidence Science Teaching (BEST) research evidence on learning pathways and on effective sequencing of ideas to develop our curriculum

planning. It presents a possible route for progression through a five-year curriculum in chemistry and Earth science for age 11-16.

'Working scientifically' is described separately at the beginning of the programme of study, but must always be taught through and clearly related to substantive science content in the programme of study. Teachers should feel free to choose examples that serve a variety of purposes, from showing how scientific ideas have developed historically to reflecting modern developments in science. Pupils should develop their use of scientific vocabulary, including the use of scientific nomenclature and units and mathematical representations.

Physics
Skills and Knowledge learned by the end of year 9

Topic 1 Energy

- calculate the amounts of energy associated with a moving body, a stretched spring, and an object raised above ground level
- describe and calculate the changes in energy involved when a system is changed by heating (in terms of temperature change and specific heat capacity), by work done by forces and by work done when a current flows
- explain, with reference to examples, the definition of power as the rate at which
- describe all the changes involved in the way energy is stored when a system changes, for common situations: appropriate examples might be an object projected upwards or up a slope, a moving object hitting an obstacle, an object being accelerated by a constant force, a vehicle slowing down, bringing water to a boil in an electric kettle
- describe, with examples, the relationship between the power ratings for domestic electrical appliances and the changes in stored energy when they are in use.
- describe with examples where there are energy transfers in a system, that there is no net change to the total energy of a closed system (qualitative only)
- describe, with examples, how in all system changes, energy is dissipated, so that it is stored in less useful ways (**Physics ONLY)**
- explain ways of reducing unwanted energy transfer e.g. through lubrication, thermal insulation; describe the effects, on the rate of cooling of a building, of thickness and thermal conductivity of its walls (qualitative only) (**Physics ONLY)**
- calculate energy efficiency for any energy transfer, and describe ways to increase efficiency (**Physics ONLY)**
- describe the main energy sources available for use on Earth (including fossil fuels, nuclear fuel, bio-fuel, wind, hydro-electricity, the tides and the Sun), compare the ways in which they are used and distinguish between renewable and nonrenewable sources
- explain patterns and trends in the use of energy resources.

Topic 2 Electricity

- recall that current is a rate of flow of charge, that for a charge to flow, a source of potential difference and a closed circuit are needed and that a current has the same value at any point in a single closed loop; recall and use the relationship between quantity of charge, current and time
- recall that current (I) depends on both resistance (R) and potential difference (V) and the units in which these are measured; recall and apply the relationship between I, R and V, and expain that for some resistors the value of R remains constant but that in others it can change as the current changes; explain the design and use of circuits to explore such effects – including for lamps, diodes, thermistors and LDRs.
- describe the difference between series and parallel circuits, explain why, if two resistors are in series the net resistance is increased, whereas with two in parallel the net resistance is decreased (qualitative explanation only)
- calculate the currents, potential differences and resistances in d.c. series circuits, and explain the design and use of such circuits for measurement and testing purposes; represent them with the conventions of positive and negative terminals, and the symbols that represent common circuit elements, including diodes, LDRs and thermistors.
- recall that the domestic supply in the UK is a.c., at 50Hz and about 230 volts, explain the difference between direct and alternating voltage
- recall the differences in function between the live, neutral and earth mains wires, and the potential differences between these wires; hence explain that a live wire may be dangerous even when a switch in a mains circuit is open, and explain the dangers of providing any connection between the live wire and earth
- explain how the power transfer in any circuit device is related to the p.d. across it and the current, and to the energy changes over a given time
- describe how, in different domestic devices, energy is transferred from batteries and the a.c. mains to the energy of motors or of heating devices
- recall that, in the national grid, electrical power is transferred at high voltages from power stations, and then transferred at lower voltages in each locality for domestic use, and explain how this system is an efficient way to transfer energy.
- describe the production of static electricity, and sparking, by rubbing surfaces, and evidence that charged objects exert forces of attraction or repulsion on one another when not in contact; explain how transfer of electrons between objects can explain the phenomena of static electricity (**Physics ONLY)**
- explain the concept of an electric field and how it helps to explain the phenomena of static electricity. (**Physics ONLY)**

Skills and Knowledge learned by the end of year 10

Topic 3 Particles

- define density and explain the differences in density between the different states of matter in terms of the arrangements of the atoms or molecules
- describe how, when substances melt, freeze, evaporate, condense or sublimate, mass is conserved, but that these physical changes differ from chemical changes because the material recovers its original properties if the change is reversed. Internal energy, energy transfers and particle motions
- describe how heating a system will change the energy stored within the system and raise its temperature or produce changes of state
- define the term specific heat capacity and distinguish between it and the term specific latent heat
- • explain how the motion of the molecules in a gas is related both to its temperature and its pressure: hence explain the relation between the temperature of a gas and its pressure at constant volume (qualitative only).
- recall that gases can be compressed or expanded by pressure changes and that the pressure produces a net force at right angles to any surface
- explain how increasing the volume in which a gas is contained, at constant temperature can lead to a decrease in pressure
- explain how doing work on a gas can increase its temperature (e.g. bicycle pump).

Topic 4 Radiation

- describe the atom as a positively charged nucleus surrounded by negatively charged electrons, with the nuclear radius much smaller than that of the atom and with almost all of the mass in the nucleus
- recall the typical size (order of magnitude) of atoms and small molecules
- describe how and why the atomic model has changed over time
- recall that atomic nuclei are composed of both protons and neutrons, that the nucleus of each element has a characteristic positive charge, but that atoms of the same elements can differ in nuclear mass by having different numbers of neutrons
- relate differences between isotopes to differences in conventional representations of their identities, charges and masses.
- recall that in each atom its electrons are arranged at different distances from the nucleus, that such arrangements may change with absorption or emission of electromagnetic radiation and that atoms can become ions by loss of outer electrons
- recall that some nuclei are unstable and may emit alpha particles, beta particles, or neutrons, and electromagnetic radiation as gamma rays; relate these emissions to possible changes in the mass or the charge of the nucleus, or both
- use names and symbols of common nuclei and particles to write balanced equations that represent radioactive decay
- explain the concept of half-life and how this is related to the random nature of radioactive decay
- recall the differences in the penetration properties of alpha-particles, beta-particles and gamma-rays

- recall the differences between contamination and irradiation effects and compare the hazards associated with these two.
- explain why the hazards associated with radioactive material differ according to the half-life involved
- describe the different uses of nuclear radiations for exploration of internal organs, and for control or destruction of unwanted tissue.
- recall that some nuclei are unstable and may split, and relate such effects to radiation which might emerge, to transfer of energy to other particles and to the possibility of chain reactions (**Physics ONLY)**
- describe the process of nuclear fusion and recall that in this process some of the mass may be converted into the energy of radiation. (**Physics ONLY)**

Topic 5 Forces

- recall examples of ways in which objects interact: by gravity, electrostatics, magnetism and by contact (including normal contact force and friction), and describe how such examples involve interactions between pairs of objects which produce a force on each object; represent such forces as vectors
- define weight, describe how it is measured and describe the relationship between the weight of that body and the gravitational field strength
- describe examples of the forces acting on an isolated solid object or system; describe, using free body diagrams, examples where several forces lead to a resultant force on an object and the special case of balanced forces when the resultant force is zero (qualitative only)
- explain, with examples, that to stretch, bend or compress an object, more than one force has to be applied
- describe the difference between elastic and inelastic distortions caused by stretching forces; calculate the work done in stretching; describe the relationship between force and extension for a spring and other simple systems; describe the difference between linear and non-linear relationships between force and extension, and calculate a spring constant in linear cases.
- use the relationship between work done, force, and distance moved along the line of action of the force and describe the energy transfer involved.
- recall that the pressure in fluids causes a force normal to any surface, and use the relationship between the force, the pressure, and the area in contact (**Physics ONLY)**
- describe a simple model of the Earth's atmosphere and of atmospheric pressure, and explain why atmospheric pressure varies with height above the surface (**Physics ONLY)**
- explain why pressure in a liquid varies with depth and density and how this leads to an upwards force on a partially submerged object; describe the factors which influence floating and sinking. (**Physics ONLY)**
- describe examples in which forces cause rotation; define and calculate the moment of the force in such examples. (**Physics ONLY)**
- explain how levers and gears transmit the rotational effects of forces. (**Physics ONLY)**

- explain the vector-scalar distinction as it applies to displacement, distance, velocity and speed
- recall typical speeds encountered in everyday experience for wind and sound, and for walking, running, cycling and other transportation systems; recall the acceleration in free fall and estimate the magnitudes of everyday accelerations
- explain with examples that motion in a circular orbit involves constant speed but changing velocity (qualitative only)
- make measurements of distances and times, calculate speeds, and make and use graphs of these to determine the speeds and accelerations involved.
- apply Newton's First Law to explain the motion of objects moving with uniform velocity and also objects where the speed and/or direction change
- apply Newton's Second Law in calculations relating forces, masses and acceleration
- explain that inertial mass is a measure of how difficult it is to change the velocity of an object and that it is defined as the ratio of force over acceleration
- recall Newton's Third Law and apply it to examples of equilibrium situations
- define momentum and describe examples of momentum in collisions.
- explain methods of measuring human reaction times and recall typical results
- explain the factors which affect the distance required for road transport vehicles come to rest in emergencies and the implications for safety
- explain the dangers caused by large decelerations and estimate the forces involved in typical situations on a public road.

Skills and Knowledge learned by the end of year 11

Topic 6 Waves

- describe wave motion in terms of amplitude, wavelength, frequency and period;
- define wavelength and frequency and describe and apply the relationship between these and the wave velocity
- describe the difference between transverse and longitudinal waves
- describe how ripples on water surfaces are examples of transverse waves whilst sound waves in air are longitudinal waves, and how the speed of each may be measured; describe evidence that in both cases it is the wave and not the water or air itself that travels.
- describe the effects of reflection, transmission, and absorption of waves at material interfaces
- describe, with examples, processes which convert wave disturbances between sound waves and vibrations in solids, and explain why such processes only work over a limited frequency range, and the relevance of this to human audition (**Physics ONLY)**

- explain, in qualitative terms, how the differences in velocity, absorption and reflection between different types of waves in solids and liquids can be used both for detection and for exploration of structures which are hidden from direct observation, notably in our bodies, in the earth's core and in deep water.
- recall that light is an electromagnetic wave
- recall that electromagnetic waves are transverse, are transmitted through space where all have the same velocity, and explain, with examples, that they transfer energy from source to absorber
- describe the main groupings of the spectrum – radio, microwave, infra-red, visible (red to violet), ultra-violet, X-rays and gamma-rays, that these range from long to short wavelengths and from low to high frequencies, and that our eyes can only detect a limited range.
- recall that different substances may absorb, transmit, refract, or reflect these waves in ways that vary with wavelength; explain how some effects are related to differences in the velocity of the waves in different substances
- recall that radio waves can be produced by or can themselves induce oscillations in electrical circuits
- recall that changes in atoms and nuclei can also generate and absorb radiations over a wide frequency range
- give examples of some practical uses of electromagnetic waves in the radio, micro-wave, infra-red, visible, ultra-violet, X-ray and gamma-ray regions and describe how ultra-violet waves, X-rays and gamma-rays can have hazardous effects, notably on human bodily tissues.
- use ray diagrams to illustrate reflection, refraction and the similarities and differences between convex and concave lenses (qualitative only) (**Physics ONLY)**
- explain how colour is related to differential absorption, transmission, specular reflection and scattering. (**Physics ONLY)**
- explain that all bodies emit radiation and that the intensity and wavelength distribution of any emission depends on their temperatures (**Physics ONLY)**
- explain how the temperature of a body is related to the balance between incoming radiation absorbed and radiation emitted; illustrate this balance using everyday examples and the example of the factors which determine the temperature of the earth. (**Physics ONLY)**

Topic 7 Magnets and Electromagnets.

- describe the attraction and repulsion between unlike and like poles for permanent magnets and describe the difference between permanent and induced magnet
- describe the characteristics of the magnetic field of a magnet, showing how strength and direction change from one point to another
- explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic.
- describe how to show that a current can create a magnetic effect and describe the directions of the magnetic field around a conducting wire

- recall that the strength of the field depends on the current and the distance from the conductor, and explain how solenoid arrangements can enhance the magnetic effect (**Physics ONLY)**
- describe how a magnet and a current-carrying conductor exert a force on one another and show that Fleming's left-hand rule represents the relative orientations of the force, the conductor and the magnetic field (**Physics ONLY)**
- apply the equation that links the force on a conductor to the magnetic flux density, the current and the length of conductor to calculate the forces involved (**Physics ONLY)**
- explain how this force is used to cause rotation in electric motors. (**Physics ONLY)**
- recall that a change in the magnetic field around a conductor can give rise to an induced potential difference across its ends, which could drive a current, generating a magnetic field that would oppose the original change; hence explain how this effect is used in an alternator to generate a.c., and in a dynamo to generate d.c. (**Physics ONLY)**
- explain how the effect of an alternating current in one circuit in inducing a current in another is used in transformers and how the ratio of the p.d.'s across the two depends on the ratio of the numbers of turns in each. (**Physics ONLY)**
- explain the action of the microphone in converting the pressure variations in sound waves into variations in current in electrical circuits, and the reverse effect as used in loudspeakers and headphones. (**Physics ONLY)**

Topic 8 Space (**Physics ONLY)**

- recall the main features of our solar system, including the similarities and distinctions between the planets, their moons, and artificial satellites (**Physics ONLY)**
- explain for circular orbits how the force of gravity can lead to changing velocity of a planet but unchanged speed, and explain how, for a stable orbit, the radius must change if this speed changes (qualitative only) (**Physics ONLY)**
- recall that our sun was formed from dust and gas drawn together by gravity and explain how this caused fusion reactions, leading to equilibrium between gravitational collapse and expansion due to the fusion energy. (**Physics ONLY)**
- explain the red-shift of light from galaxies which are receding (qualitative only), that the change with distance of each galaxy's speed is evidence of an expanding universe and hence explain the link between this evidence and the Big-Bang model. (**Physics ONLY)**

Long term planning grid

	Year 9	Year 10	Year 11
Autumn 1	KS3 T22 - Sound	Topic 3 – Particle Model of Matter	Topic 6 - Waves

Autumn 2	KS3 T23 - Light	Topic 4 – Atomic Structure	Topic 7 – Magnetism and electromagnetism
Spring 1	Topic 1 – Energy	Topic 5 – Forces	Topic 8 – Space ***(Sep Phys only)***
Spring 2			Revision and Exams
Summer 1	Topic 2 – Electricity	Revision and Mock Exams	
Summer 2			

Short Term planning

The 6 part lesson layout of the 6 'P's is based on the principles laid out by Rosenshine (2012) incorporated into our practice, would substantially increase the quality of teaching and learning, improving outcomes for all students.

The 6'P's follow the familiar format to Rosenshine's principles

Prepare - Begin the lesson with a review of previous learning.
Purpose - Present new material in small steps.
Present - Ask a large number of questions (and to all students) and provide models and worked examples.
Practice - Practice using the new material and check for understanding frequently and correct errors.
Prove - Independent practice and provide scaffolds for difficult tasks
Ponder – Reviews work

Prepare Activities
Checking and repairing prior knowledge is the first stage of learning. Without the prior knowledge, the new learning can't be understood and leads to recall as vaguely 'remembered'. Establishing the level of knowledge leads to the use the use other effective methods, such as using analogies, to link the new learning to things which are already known. What strategies are we using?

1. Titles are coded so that can be referenced by students can use books to self-reflect and retrieve information
2. Different tasks that Focus on tier 3 key words and previous knowledge recall
3. Questions are spaced out, interleaved allowing student to use retrieval practice to look though previous work in book.
4. A learning journal allows students to be more reflective to record areas of improvement from the prepare activities
5. The revision lesson prepare activity allows students to recall level 3 key words throughout the topic
6. Some lessons that use an image to capture interest the interactive slides contain metacognitive questions to improve reflective thinking
7. General prepare activities - Recap questions, Define 5 tier 3 keywords, What am I?, Finish the sentences, Match the keywords, Anagram with clue, What is

the picture?, Write questions to the keywords, True false quiz, Sketch me, Articulate, Review video, Kahoot.

Purpose

Clear and specific lesson objectives and outcomes, teamed with effective checks for understanding and modifying instruction as needed, allow for students to know where they are going and when they have arrived. Students may want to know why they are spending time in school learning this. At this stage student can be asked if they understand the significance and real-world application of the concepts being taught. What strategies are we using?

1. Learning question displayed to be recorded into books.
2. Levelled outcomes displayed for students to reflect on what they may achieve in the lesson.
3. Tier 3 keywords displayed to be used throughout the lesson
4. Interactive metacognitive questions to engage student in reflective thinking on why this lesson is done and linked to real world application.

Present

Presentation of the new learning by either teaching, or the students reading a textbook or watching a video, or the students watching a demonstration. The retention at this stage is about 5%, and it varies: some students learn a lot, whereas others learn nothing. What strategies are we using?

1. Improving presentation of student notes by using Cornell note taking. The note taking layout is shown on the slides and using example modelled worksheets
2. Using presentation slides that includes video clips, text, graphical and multi-sensory methods to engage students
3. Making sure the Tier 3 keywords are explicitly showed, discussed, and written in exercise books.
4. Making Links to prior knowledge and ideas that are more abstract linking it to more concrete examples
5. A interactive tackling misconception statement slide with metacognitive questions to be discussed
6. Presenting short pieces of new information recognising the limits of working memory. a strategy used to reduce the cognitive load as the learner processes information e.g. Exploring one idea at a time, one equation, skill to develop.
7. Asking a large number of questions and check for understanding. - Questions are the most powerful tool, they can highlight misconceptions, keep a lesson flowing and challenge students to think deeper into a subject. The greatest value of questioning though is that they force students to practice retrieval, this strengthens and deepens memory. Methods we use -Cold calling, Class vote, ABC, Brainstorming, Think-pair-share, Discussing images and text, Misconception, reflective questions on student's ideas.
8. Using more time to provide explanations. – Depending on the class you may need to readdress a particular area. Ideas - using students who have understood as experts to explain to others. We have extension work ready to allow some students to move on but we can go over the material again for students 'who have struggled'

9. When presenting video, making sure students have a question sheet to take active notes.

Practice

In this part of the lesson, the students become involved. Teachers and assistants get involved in helping students put into practice what they've learned. We use modelling, practical work, group or cooperative learning activities. We monitor and observe students, giving direction and over-come issues student have. The lessons are designed to model what we expect from students and lead student through each activity. What strategies are we using?

1. Using a diverse range of activities from practical, modelling, card sorts, research tasks, comprehension tasks, market places, circus activities. Making sure we use scaffolding up strategies and not differentiating down. Method of scaffolding - Print out of slides, checklists, cue cards, writing frames Show and Tell, Tap into individual prior knowledge, Student verbally giving ideas, Using visual aids, Vocabulary sheets, Giving more 'think' time.
2. Guiding students as they begin to practice. - The scaffolds can then be gradually removed as their competency grows. Teachers also anticipate commonly made errors and build tools into the scaffold tasks that reduce the chances of students making the same mistakes.
3. Using interactive metacognitive question slides to encourage reflective thinking. This slides are used for preparing for a task or practical and for writing conclusions.
4. Using 'Think aloud' and model steps. It allows teachers to diagnose students' strengths and weakness. Methods we use - The think-aloud strategy asks students to say out loud what they are thinking about when reading, solving problems, or simply responding to questions posed by teachers or other students. It allows teachers to diagnose students' strengths and weakness.
5. Providing a high level of active practice for all students. Concentration limit may dip between 10 and 20 minutes, Active learning promotes recall and deeper understanding of material, as students are engaging with the content rather than simply listening to it. What methods we use –; Question practice, reading, worksheets, news article, a particular skill.
6. Providing many examples - Delivering new information to students by linking it to something or some process they are familiar with allows students to gain an understanding quicker, it also gives them deeper retention. This is especially true of more conceptual ideas. Method we use – Short YouTube clips, images, text, news articles.
7. Providing models of worked-out problems. By working through a problem with students, modelling thinking and decision making at all points, students are made aware of the thought processes that we go through in order to solve it, thus reducing cognitive load. What we use- previous exam questions and answers
8. Checking the responses of all students. Assess whether the students can move on to more independent work Methods we use - hand up, white boards, Votes, asking a range of students
9. Each task has answers for quick feedback and self-assessment

10. Reteach material when necessary. – Depending on the students' responses, the teacher then can decide on whether any parts of the new information needs re-teaching.

Prove

The students' have an opportunity work independently on what we have led them to in the input and guided practice parts of the lesson. This is a self, peer or teacher assessed challenging task. The aim our tasks is to exercise the pathways which connect the new material and the existing prior knowledge, so that the new learning goes into the long term memory. Our judgement of our students' prior knowledge is key in helping us to set an appropriate challenging task and therefore at this stage we have differentiated help sheets and extension work to go with the task. What strategies are we using?

1. Literacy questions to improve students extended responses to focussed questions.
2. Preparing students for independent activity. - Students should be competent in the task and therefore can practice the task independently. This repetition of the task will promote a deeper fluency. What we use – Series of questions, Exam question, extending writing, newspaper article, storyboard, showing a practical skill, Drawing, Conclusion, etc
3. Monitoring students when they begin independent activities. - Monitoring students' work in the classroom has been recognized as one of the key factors for successful teaching since only a good real-time assessment enables the teacher to give proper and timely feedback. What we do – Working around group, having target groups, Use of TA, Asking to see a sample of work, live marking
4. Challenging questions that are all peer or self-assessed answers
5. Numeracy focussed questions
6. Scaffolding tasks that include extension and help sheets

Ponder

Using a range time-efficient strategies to give effective feedback. What strategies are we using?

1. Every written question has answers to go with it for effective feedback
2. Every literacy or numeracy assessments has success criteria.
3. Question slide/sheet has been assigned to self-assessment, peer assessment or teacher assessment so that the type of assessment is fairly assigned
4. The use of interactive metacognitive questioning slides in literacy tasks to encourage reflective thinking skills
5. Outcome slide shared again so students can reflect on what they have reached
6. The use of 'ponderwall'- interactive metacognitive questions wall to finish the lesson on reflecting on it.
7. Revision lessons have the 'ponderwall' revision metacognitive questions for student to engage in reflecting on their revision strategies
8. On test lessons there is an end of topic metacognitive reflective questions to reflect on how they have learned the topic.
9. Providing systematic feedback and corrections. To provide students with successes and gaps in their knowledge and addressing it. What we use - Asking students to share answers, Self and Peer assessment (success

criteria or solutions needs to be shared) Marking work (including SPAG) WWW, EBI, Whole class feedback sheet, Writing specific target question.

10. Asking students to explain what they have learned and how they have learned. Helping students "think about their thinking" is an important tool in helping them master course content as well as improve their strategies for learning. There are a number of approaches from simple to complex helping students acquire skills in "metacognition." What we use – Ponderwall, Show hands, Ask sample students.

Repetition

We value repetition as an essential aspect to secure the new learning as long-term memories. The repetitions tasks such as homework, half termly quizzes, end of topic revision and tests. What strategies are we using?

1. Homework activities are shared on Google classroom via epraise. Teachers have a selection of appropriate activities to set.
2. Starter (prepare) activities that have 5 level 3 keywords questioned in different ways that have been spaced and interleaved throughout the lessons
3. End of topic revision tasks, each revision lesson has a different task that encourages retrieval practice all with practice questioning.

DIT Lessons.

A lesson dedicated after each end of topic test for students to reflect using their learning journals on their test answers and areas of strengths and weaknesses. Students fill out a Frayer model. This is a graphic organizer that helps students determine or clarify the meaning of vocabulary words encountered within the topic. It is also used to discuss and practice questions from the end of unit test.

Online learning platform

The use of google classroom will:

- Enable students to have access to every lesson taught to consolidate learning.
- Pre topic quizzes to help analyse gaps in learning
- Students who are absent from the lesson not to miss lesson content
- End of topic practice quiz assignments
- A copy of any handed out homework if they misplace it
- Access to tutorial video clips for each lesson
- Access to revision material, past papers, revision strategies to prepare for assessment
- Allowing students to consolidate soft skills such as time management, organising revision, use of IT.

The use of GCSEpod for year 9 onwards allows student to access to have short videos on each lesson followed by short quiz and long exam type questions.

BAME in Science

In the 2020 Biochemist journal titled BAME scientists: the hidden pioneers? Hanshikaa Shyamsundar questions why then is there still a lack of Black, Asian and minority ethnic (BAME) representation within Science, Technology, Engineering and Mathematics (STEM)?

Therefore In our science curriculum it is important that we provide an opportunity to feature the stories and voices of black scientists, engineers and mathematicians in the context of their science instruction. Helping students see the possibilities of careers in STEM fields means providing them with diverse role models. When students are educated to respect or appreciate the fact that people of BAME origin have always made good and valuable contributions to society. The value of teaching this is relevant to all students in their learning, development and in building a sense of identity and respect. Presentation of BAME pioneers have been produced and placed in appropriate topics.

- Y8 Sound topic - James E. West invention of the foil electret microphone, now the most commonly used microphone in the world.
- Y7 Space topic Katherine Johnson trailblazing mathematician whose work at NASA was critical for the first U.S. Crewed space missions, including the first moon landing
- Y7 Space topic - Christine Darden skilled mathematician, data analyst and aeronautical engineer. After working at NASA for over 40 years.
- Y10 Waves topic - Gladys West (born 1930) GPS technology that allows satellites to locate you anywhere on Earth
- Y7 How science works topic Annie Easley (1933-2011) was a "human computer," a computer scientist, an applied mathematician and a career NASA researcher.
- Y9 Organisation of the body topic - Charles Drew (1904-1950) developed new methods for storing blood for transfusions and created the first blood bank.
- Y7 Organisation topic Rebecca Lee Crumpler (1831-1895) First African American woman to earn a medical degree.
- Y9 Organisation of the body topic - Daniel Hale Williams (1856 - 1931) Dr. Daniel Hale Williams was the first cardiologist to successfully perform a tricky open heart surgery
- Y10 Nerves and Homeostasis topic - Patricia Bath (born 1942) ophthalmologist and laser scientist
- Y10 Homeostasis topic Alexa Canady (born 1950) first African American and first woman to graduate from the neurosurgical residency program at the University of Minnesota.
- Y8 Health and lifestyle topic Marie M. Daly (1921-2003). While earning her Ph.D., Daly studied how compounds produced by organs such as the pancreas contribute to digestion
- Y9 Infection and response topic Alice Augusta Ball (1892-1916) Chemist Alice Augusta Ball developed a successful treatment for Hansen's disease, also known as leprosy, a bacterial infection
- Y7 working scientifically topic Dorothy Vaughaun (1910-2008) Dorothy Vaughaun, a skilled mathematician and "computer," became NASA's first Black manager
- Y7 Forces topic Mary Jackson (1921-2005) NASA's first Black female engineer
- Y7 Reproduction topic Ernest Everett Just (1883–1941) American biologist who conducted pioneering research in cell physiology, embryonic development and fertilization.
- Y7 Space topic Mae C. Jemison (born 1956) first African American woman to reach space
- Y10 Ecology topic -Vernard Lewis first Black entomologist.

- Y7 Space topic Benjamin Banneker (1731-1806) successfully predicted the solar eclipse that occurred on April 14, 1789 SPACE

Super Curriculum.
In science, we want to give students every opportunity to develop their love of learning. We have developed a Science Super Curriculum which provides students with a range of suggested activities that take their regular curriculum further. These activities take the student beyond what their teacher has taught them in the classroom.
These activities can take many forms including watching videos, completing individual, visiting museums or their websites and reading online articles with complementary quizzes.
Engaging in super curricular activities enables students to develop specialist knowledge in areas that already seize their interest, but it can also inspire curiosity about areas previously unknown and unventured.
All students need to do is click on the link browse which activity you may want to do. If students complete the articles, there is a short comprehension quiz to have a go at. Students tell their teacher that you have completed it and collect the topic stickers!
There are multiple activities to achieve the relevant topic sticker. Each science teacher may add an extra opportunity in a particular topic that will be set on Epraise.

Medium Term Planning

Topic	Big Questions (Purpose)	Lesson	Key Knowledge and Skills / Assessment	Links to other subjects
Unit 1 Energy				
Unit 1 Energy	***How is energy transferred from stored energy?***	T1L1 – Energy stores and transfers	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Name the different energy stores and the methods in which energy is transferred. State the law of conservation of energy. Describe example energy transfers for different appliances and examples using energy transfer diagrams. Prove: Self-assessed exam question Ponder: Review and correct work	Maths – Values for energy transfers to show conservation of energy.
	What is the relationship between mass,	T1L2a - Weight	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions	English – describing and explaining

	weight and gravity?		Practise: Define what 'centre of mass' is. Describe the difference between weight and mass. Practical to calculate the gravitational field strength of Earth. Calculate weight using w = mg and be able to rearrange the equation to complete a range of calculations. Prove: Peer-assessed calculations exam question Ponder: Review and correct work	Maths – Calculations using w = mg equation.
	How is kinetic and gravitational potential energy calculated?	T1L2b – Kinetic Energy (KE) and Gravitational Potential Energy (GPE)	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Define what gravitational potential energy is and what kinetic energy is. Use the correct equations for calculations and complete questions involving rearranging the equations. Prove: Self-assessed exam questions Ponder: Review and correct work	Maths – GPE and KE calculations English – describing definitions
	What happens to a spring when its stretched?	T1L3 – Hooke's Law RP	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what extension and tension are. Complete the Hooke's Law required practical and use results to calculate the spring constant. Prove: Peer-assessed exam question – extended writing Ponder: Review and correct work	English – describing and explaining. Maths – spring constant calculations
	How is thermal energy in substances calculated?	T1L4 – Thermal Energy Transfer	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Compare thermal energy in different substances. Complete the practical to find out which substance gets the hottest and use the equation to calculate thermal energy change. Prove: Self-assessed exam questions Ponder: Review and correct work	Maths – calculations for energy changes. English – describing and explaining.
	How is thermal	T1L5 – Specific	Prepare: Knowledge recall questions Present: New information,	English - describing

	energy in substances calculated?	Heat Capacity (SHC)	video clip and key questions, tackle misconceptions Practise: Describe the differences between heat and temperature. Define specific heat capacity and complete calculations. Prove: Self-assessed calculation example questions. Ponder: Review and correct work	and explaining Maths – calculations for SHC.
	How specific heat capacity worked out practically?	T1L6 – Specific Heat Capacity Required Practical	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Recall definition for SHC. Label equipment used for the RP. Complete the required practical and calculate the SHC of three different metals. Compare results to true values and evaluate the practical. Prove: Peer-assessed calculation exam questions Ponder: Review and correct work.	English - describing and explaining Maths – calculation questions
	How do you calculate the energy transferred during work?	T1L7 – Work done	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Define work done linked to energy transfers. Complete example calculations using equations W = Fs. Practical to calculate work done when mass is added to a wooden block and moved. Prove: Self-assessed exam questions Ponder: Review and correct work.	English – describing and explaining Maths – work done calculations
	How do you calculate the energy transferred in a certain time?	T1L8 – Power	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Define the term power and identify how it is calculated. Use equations for calculating power. Practical model cranes and calculate power when lifting different masses. Prove: Peer-assessed power calculation questions Ponder: Review and correct work.	English – describing definitions Maths – Power calculation questions

	How can we reduce energy dissipation ?	T1L9a – Conservation of Energy	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe ways that energy is dissipated to the surroundings. Practical to investigate the effect of single and double glazing on energy dissipation. Prove: Self assessed exam style question Ponder: Review and correct work.	English - describing and explaining Maths – calculating temperature changes in practical.
	How can we reduce heat dissipation in a cup?	T1L9b – Insulation Required Practical ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Identify and define different types of variables in scientific experiments. Practical to investigate which materials make good insulators. Prove: Conclusion from experiment linking results to knowledge of insulating materials Ponder: Review and correct work.	English - describing and explaining Maths – Calculations on experimental results.
	How is useful energy calculated compared to wasted energy?	T1L10a – Energy efficiency	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Using energy transfer diagrams to identify useful and wasted energy transfers. Describe what 'efficiency' means and be able to use the equation to calculate efficiency of different energy transfer examples. Prove: Peer assessed exam style question Ponder: Review and correct work.	English - describing and explaining Maths – energy efficiency calculations
	How is useful energy calculated compared to wasted energy?	T1L10b – Improving efficiency ***(HT only)***	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Describe ways to reduce energy dissipation in moving and non-moving objects. Explain what a U-value is. Design a house to be energy efficient within a set budget. Calculate pay-back times for costs of insulation in a home.	English - describing and explaining and extended writing Maths – Calculations for payback times

			Prove: Teacher assessed extended writing exam style question Ponder: Review and correct work.	Business – managing a budget.
	How do we use non-renewable resources?	T1L11 – Fossil fuels	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Describe the difference between renewable and non-renewable resources and identify examples. Describe how a power station works to generate electricity. Prove: Self assessed extended writing exam style question Ponder: Review and correct work.	English - describing and explaining and extended writing
	What are the pros and cons of energy resources?	T1L12 – Renewable energy resources	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Describe how different methods are used to generate electricity. Evaluate each method to give an advantage and a disadvantage for each. Practical investigating the impact of cloud cover on the effectiveness of solar panels. Prove: Peer assessed exam style questions Ponder: Review and correct work.	English – describing and explaining
	How can I improve my knowledge of this topic?	T1L13 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T1L14 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Unit 2 Electricity				
Unit 2 Electricity	***What do components in a circuit do?***	T2L1 – Circuits and components	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Identify different circuit components and their uses. Construct circuit diagrams from descriptions of components used. Prove: Teacher assessed extended writing exam style question	English - describing and explaining

			Ponder: Review and correct work.	
	How is current and potential difference measured?	T2L2 – Current and Potential Difference	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what current and potential difference are and how they are measured. Complete calculations for charge flow using Q = It equation. Prove: Self assessed exam style questions. Ponder: Review and correct work.	English - describing and explaining Maths – Charge flow calculations
	What is resistance and how is it calculated?	T2L3 – Resistance (V = IR)	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Describe resistance in a circuit relating to electrons, calculate resistance using V = IR equation. Plot data onto a graph to demonstrate Ohm's Law. Prove: Self assessed exam style questions. Ponder: Review and correct work.	English - describing and explaining Maths – plotting graphs and resistance calculations.
	What happens to resistance in increasing length of wire?	T2L4 – Resistance in a wire Required Practical	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Complete the resistance in a length of wire required practical. Plot a graph of results and write a conclusion to explain how the length of a wire effects the resistance in the wire. Prove: Self assessed extended writing exam style questions. Ponder: Review and correct work.	English - describing and explaining Maths – plotting a graph
	What is Ohms Law?	T2L5 – Ohmic and Non-ohmic resistors	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Recap conclusion from length of wire and resistance RP. Use graph to demonstrate ohmic resistors. Compare graphs for filament lamps and diodes to describe a non-ohmic resistor. Explain how thermistors and LDRs work	English - describing and explaining Maths – interpreting trends in graphs

			Prove: Self assessed exam style questions. Ponder: Review and correct work.	
	What does current and potential difference do in series and parallel circuits?	T2L6 – Series and Parallel circuits	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Identify the differences between series and parallel circuits. Compare the current, potential difference and resistance in series and parallel circuits completing example questions and calculations. Prove: Self assessed summary questions on resistance calculations Ponder: Review and correct work.	English - describing and explaining Maths – calculating current, potential difference and resistance.
	How do we use mains electricity safely?	T2L7 – Mains electricity	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the difference between alternating and direct current. Label the components of a plug and cable. Practical wiring a plug and explain the function of each part and wire. Identify the safety features in the plug. Prove: Self assessed exam questions Ponder: Review and correct work.	English - describing and explaining DT – using tools to wire plug
	How is power calculated?	T2L8 – Electrical power and fuses	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what Power is in terms of electrical appliances. Complete calculations including rearranging the equation P = E/t. Calculate Power using current and potential difference (P = IV) and identify the correct fuse to use for the different appliances. Describe how a fuse in a plug works. Use equation for Power, current and Resistance ($P = I^2 \times R$) Prove: Self assessed exam style questions using the different power equations. Ponder: Review and correct work.	English - describing and explaining Maths – Power equations and calculations

	How is the energy transferred in electrical devices calculated?	T2L9 – Energy transfer	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what energy transfer and electrical charge is. Complete calculations using energy transfer equation (E = QV and E = Pt) Practical using power meters to measure the power of each appliance and then calculate the energy transferred in 60 seconds. Prove: Self assessed exam style questions using equations Ponder: Review and correct work.	English - describing and explaining Maths – equations and calculations
	How is electrical energy transferred to our homes?	T2L10 – National Grid	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what the National Grid is and how it works. Draw and label a diagram to show the National Grid, including the voltage at different points in the system. Describe what the role of step-up and step-down transformers is related to efficiency and safety. Prove: Peer assessed extended writing question Ponder: Review and correct work.	English - describing and explaining
	How do objects insulating produce a charge?	T2L11 – Static Electricity ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Recall structure of the atom and properties of sub-atomic particles. Describe how a static charge is created. Practical demonstration using the Van de Graaff generator. Describe electric field strength and how it changes. Identify uses and dangers of static electricity Prove: Self assessed summary questions Ponder: Review and correct work.	English - describing and explaining
	How can I improve my knowledge	T2L12 - Revision	Review of whole topic and revision activities ready for end of topic test	

	of this topic?			
		T2L13 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Unit 3 Particle Model of Matter				
Unit 3 Particle Model of Matter	***What is the density of different materials?***	T3L1a – Density	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Describe the difference between mass and density. Practical calculate density and then predict if it will sink or float. Calculate density using ρ = m/V. Prove: Self assessed density calculations Ponder: Review and correct work.	English - describing and explaining Maths – Calculating density
	How do we measure density in different objects?	T3L1b – Density Required Practical	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Recap density equation and how to calculate density of regular objects. Required practical how to calculate density of irregular shaped objects. Extended answer writing up the method for the practical. Prove: Peer assessed summary questions Ponder: Review and correct work.	English - describing and explaining Maths – calculations on density
	How do the particles behave during changes of state?	T3L2 – State of matter	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Recall particle models for solids, liquids and gases and describe kinetic theory. Describe the processes happening during changes of state. Prove: Self assessed summary questions Ponder: Review and correct work.	English - describing and explaining
	How is specific heat capacity is worked out practically?	T3L3a – Internal Energy Transfer	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Recall definition of SHC, and describe the equipment used to	English - describing and explaining Maths – SHC calculations

			measure it. Complete the required practical to determine SHC of different metals. Prove: Peer assessed exam style question. Ponder: Review and correct work.	
	How do you calculate changes in thermal energy?	T3L3b – Internal Latent Heat	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Define specific latent heat, and use this to describe the phase transitions for a substance being heated. Use the equation to calculate specific latent heat. Define the terms specific latent heat of fusion and specific latent heat of vaporisation. Prove: Peer assessed exam style questions. Ponder: Review and correct work.	English - describing and explaining. Maths – specific latent heat calculations
	How does heat affect the particles in a gas?	T3L4 – Gas Pressure	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what causes gas pressure. Predict what would happen as the temperature of the gas is increased. Observe and describe random motion in particles. Practical – collapsing can experiment and describe why the can collapses. Prove: Teacher assessed exam style questions. Ponder: Review and correct work.	English - describing and explaining
	How can I improve my knowledge of this topic?	T3L5 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T3L6 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Unit 4 Atomic Structure				
Unit 4	***What is inside an atom?***	T4L1 – Atomic Structure	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions	English - describing and explaining

			Practise: Recall the structure of an atom and the properties of the subatomic particles. Using the information from the periodic table, identify numbers of subatomic particles in different elements. Recall what an isotope is and how it is different referring to neutrons and mass. Work out subatomic particles in different isotope examples. Prove: Self assessed exam style questions including word and symbol equations. Ponder: Review and correct work.	Maths – working out subatomic particles.
	How was the atom model developed?	T4L2 – History of the Atom	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Describe the different models of the atom linked to key scientists and key discoveries. Describe Rutherford's alpha scattering experiment including key findings. Create a timeline for the development of the model of an atom. Prove: Self assessed exam style questions including word and symbol equations. Ponder: Review and correct work.	English - describing and explaining History – timeline of key discoveries
	What are the 3 types of radioactive decay?	T4L3 – Alpha, Beta and Gamma	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Identify the 3 types of radioactive decay. Describe key properties of alpha, beta and gamma including size, structure, charge and ionizing strength. Describe the practical and conclusions from testing absorption of the different sources. Prove: Self assessed extending writing question. Ponder: Review and correct work.	English - describing and explaining
	How is radioactive decay shown in an equation?	T4L4 – Radiation equations	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe how radioactive decay is represented in a nuclear	English - describing and explaining

			equation. Create example nuclear equations for both alpha and beta decay. Describe a decay chain. Prove: Peer assessed decay chain of nuclear equations. Ponder: Review and correct work.	Maths – Decay equations
	How do you time how long the amount radioactivity decreases?	T4L5 – Half Life	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what half life is related to decay. Use a graph to work out half-life of examples. Practical using skittles to model half life decay, plot graph from results and determine the half-life for the experiment. Prove: Self assessed exam question. Ponder: Review and correct work.	English - describing and explaining Maths – using and plotting graphs
	What are the hazards associated with radioactive material?	T4L6 – Hazards of radiation	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe examples of background radiation. Describe what contamination is and what the hazards linked to it are. Describe how Litvinenko was contaminated. Prove: Teacher assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining and extended writing answer
	How is radiation detected and used?	T4L7 – Monitoring radiation	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe ways that radiation can be detected. Compare the differences between contamination and irradiation. Describe different ways that radiation is used in medical treatments. Prove: Self assessed summary questions. Ponder: Review and correct work.	English - describing and explaining
	What is nuclear fission and fusion?	T4L8 – Nuclear Fission and Fusion	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions	English - describing and explaining and extended

		(Sep Phys only)	Practise: Describe the differences between fission and fusion. Identify examples of each. Describe what a chain reaction is and how it is caused. Describe how fission and fusion reactors work giving advantages and disadvantages of each one. Prove: Self assessed exam questions. Ponder: Review and correct work.	writing answer
	How can I improve my knowledge of this topic?	T4L9 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T4L10 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Unit 5 - Forces				
Unit 5 – Forces	***What are the different types of forces?***	T5L1 - Forces	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe and identify different scalar and vector quantities. Identify examples of contact and non-contact forces. Practical to investigate force needed to move different objects. Prove: Self assessed exam questions. Ponder: Review and correct work.	English - describing and explaining Maths – scalar and vector quantities
	What is the relationship between mass, weight and gravity?	T5L2 – Weight	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the difference between weight and mass. Calculate weight using W = mg. Practical to calculate the gravitational field strength. Complete calculations to determine gravitational field strength on different planets. Prove: Peer assessed calculation questions. Ponder: Review and correct work.	English - describing and explaining Maths – calculations and rearranging equation

	What is a resultant force and how is it calculated?	T5L3 – Resultant Forces	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Describe what balanced and unbalanced forces are. Calculate resultant forces on different examples. Describe movement of objects based on resultant force calculations Prove: Self assessed exam question. Ponder: Review and correct work.	English - describing and explaining Maths – calculate resultant forces
	How is the movement of a vector calculated?	T5L4 – Free body diagram and resolving forces ***(HT only)***	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Describe what a free body diagram is and complete examples to show reacting forces. Complete diagrams to show resolving forces using vectors. Prove: Peer assessed exam questions. Ponder: Review and correct work.	English - describing and explaining Maths – resolving forces
	How is the work done calculated?	T5L5 – Work done and energy transferred	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe who work done is the transfer of energy. Calculate work done using the equation W = Fs. Practical to calculate word done moving an object as the mass is increased. Prove: Self assessed calculation questions. Ponder: Review and correct work.	English - describing and explaining Maths – Work done calculations
	What happens to a spring when its stretched?	T5L6 – Hooke's Law Required Practical	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe extension and tension in objects. Complete the required practical on Hooke's Law and calculate the spring constant. Plot results on a graph and find the limit of proportionality. Complete calculation using and rearranging the equation.	English - describing and explaining and extended writing answer Maths – Spring constant calculations

			Prove: Peer assessed extended writing method exam question. Ponder: Review and correct work.	
	How is a turning force worked out?	T5L7a – Moments ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe factors that can affect a turning force. Identify first, second and third class levers. Calculate moments and be able to rearrange the equation M = Fd. Complete practical to investigate and calculate moments. Prove: Self assessed calculation questions. Ponder: Review and correct work.	English - describing and explaining Maths – Moment calculations
	How is a turning force worked out	T5L7b – Principle of Moments ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the law of moments. Complete calculations and identify clockwise and anticlockwise moments. Complete practical to demonstrate balancing moments. Describe turning effects of gears and complete calculations. Prove: Peer assessed calculation questions. Ponder: Review and correct work.	English - describing and explaining Maths – Moment calculations
	How do you calculate pressure of liquids?	T5L8a – Pressure in fluids ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Define the key terms fluid and liquid pressure. Recap calculations on pressure using p = F/a. Describe how liquid pressure is caused and use models to demonstrate the effect of depth on liquid pressure. Complete calculations using P = hρg equation. Prove: Self assessed extended answer explaining how a barometer works. Ponder: Review and correct work.	English - describing and explaining and extended answer Maths – Pressure calculations
	How does atmospheri	T5L8b – Pressure in fluids 2	Prepare: Knowledge recall questions Present: New information,	English - describing and

	c pressure change?	***(HT Sep Phys only)***	video clip and key questions, tackle misconceptions Practise: Describe how the Earth's atmosphere changes at altitude. Explain using the particle model how atmospheric pressure can change. Explain how changing volume of a gas can affect gas pressure. Practical on collapsing can experiment to explain how it works using particle models. Prove: Peer assessed exam questions. Ponder: Review and correct work.	explaining and extended answer Geography – atmospheric pressure
	How is speed and velocity calculated?	T5L9 – Speed and Velocity	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Compare the differences between speed and velocity. Complete calculations and rearranging the equation v = d/t. Complete practical to calculate speed of ball rolling down a ramp of different heights. Prove: Self assessed exam calculation questions. Ponder: Review and correct work.	English - describing and explaining Maths – Speed calculations
	How is speed represented in a graph?	T5L10 – Distance-time Graphs	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Calculate speed from a distance time graph. Label and describe key features of a distance time graph. Prove: Peer assessed exam calculation questions and plotting graph. Ponder: Review and correct work.	English - describing and explaining Maths – Speed calculations from graphs. Plotting and interpreting graphs.
	How is the change of speed calculated?	T5L11a – Acceleration	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the difference between speed and acceleration. Calculate acceleration using the equation a = ΔV/t. Watch the launch of the Saturn V rocket and collect data on velocity. Use data to	English - describing and explaining Maths – Acceleration calculations

			calculate acceleration at different points of the launch. Prove: Self assessed exam calculation questions. Ponder: Review and correct work.	
	How is change of speed represented on a graph?	T5L11b – Velocity-time graphs	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Use descriptions to plot a velocity time graph. Using the graph calculate acceleration at different points. Using the graph calculate the area under the line to determine the distance the object has travelled. Prove: Peer assessed exam calculation and graph questions. Ponder: Review and correct work.	English - describing and explaining Maths – Acceleration calculations, plotting graphs, calculating area under a graph.
	How is terminal velocity reached?	T5L12 – Terminal velocity	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the forces acting on an object falling through a fluid and identify points of terminal velocity. Complete practical to investigate the impact of streamlining on an object moving through a fluid. Prove: Self assessed exam questions. Ponder: Review and correct work.	English - describing and explaining
	What is the 1st and 3rd law of motion?	T5L13a – Newton's 1st and 3rd Laws	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Define Newton's 1st law of motion and apply to different examples of moving objects. Draw and label forces acting on objects using force arrows to represent magnitude of forces. Define Newton's 3rd Law and complete examples. Prove: Peer assessed examples for 1st and 3rd laws. Ponder: Review and correct work.	English - describing and explaining
	What is the 2nd law of motion?	T5L13b – Newton's 2nd Law	Prepare: Knowledge recall questions Present: New information,	English - describing

		Required Practical	video clip and key questions, tackle misconceptions Practise: Define Newton's 2nd law of motion and complete example calculations using F =ma. Complete required practical to investigate effect of force on acceleration. ***(Describe inertia – HT only)*** Prove: Self assessed extended writing exam questions. Ponder: Review and correct work.	and explaining Maths - calculations
	What is the effect of drag forces and friction?	T5L14 – Resistive Forces	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what friction is and how it is caused. Identify examples of helpful and unhelpful friction. Complete practical to investigate the roughness of a surface and force needed to move an object along it. Identify ways to reduce friction. Prove: Peer assessed extended writing questions. Ponder: Review and correct work.	English - describing and explaining and extended writing.
	What can affect the stopping distance?	T5L15 – Stopping Distances	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what stopping distance it. Identify ways in which thinking distance or braking distance can be affected. Calculate stopping distances. Practical into reaction times compared to reaction times when distracted. Prove: Peer assessed exam questions. Ponder: Review and correct work.	English - describing and explaining and extended writing. Maths – calculating stopping distances.
	How is the momentum of moving objects calculated?	T5L16a – Momentum ***(HT only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what momentum is and identify factors that can affect it. Calculate and rearrange the equation p =mv. Identify ways that momentum can be useful in safety devices. Practical investigating effect of mass on momentum.	English - describing and explaining Maths – calculating momentum.

			Prove: Self assessed exam calculation questions. Ponder: Review and correct work.	
	How is the momentum of moving objects calculated?	T5L16b – Conservation of momentum ***(HT only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what the conservation of momentum is using examples. Calculate momentum before and after collisions between objects. Prove: Peer assessed exam calculation questions. Ponder: Review and correct work.	English - describing and explaining Maths – calculating momentum.
	How can I improve my knowledge of this topic?	T5L17 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T5L18 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Unit 6 - Waves				
Topic 6 – Waves	***How does energy travel through waves?***	T6L1 – Types of waves	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Compare the two types of waves, longitudinal and transverse, draw and label key features of wave diagrams. Create accurate drawings of transverse waves given wavelengths and amplitude. Prove: Self assessed extended answer exam question. Ponder: Review and correct work.	English - describing and explaining and extended answer. Maths – working out frequencies
	How can we measure the speed of waves?	T6L2 – Measuring waves Required Practical	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe and calculate the period of a wave. Use wave diagrams to work out frequency and calculate periods. Observe the required practical for measuring wave speed (vibrations through a string and ripple tank) and describe	English - describing and explaining and extended answers. Maths – calculating period of a wave and wave speed.

			the methods used. Calculate wave speed using the equation V = fλ Prove: Peer assessed calculation exam questions. Ponder: Review and correct work.	
	How do I see objects in a mirror?	T6L3 – Reflection Required Practical ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what reflection is and how images appear in a plane mirror. Complete the reflection required practical to determine angle of reflection against angle of incidence. Draw and label ray diagrams. Compare reflections from smooth and rough surfaces. Prove: Peer assessed exam question. Ponder: Review and correct work.	English - describing and explaining and extended answers. Maths – measuring angles
	How are sound waves used to detect objects?	T6L4 – Sound waves ***(HT Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe how sound is made. Use particle models to explain how the speed of sound is different through solids, liquids and gases. Describe how the ear detects sounds and how we 'hear' the sound. Describe what ultrasound is and how it works. Identify uses of ultrasound and how distances can be calculated using it. Prove: Self assessed summary questions. Ponder: Review and correct work.	English - describing and explaining Maths – calculating distance using ultrasound echo
	What are the properties of the electromagnetic spectrum?	T6L5 – The Electromagnetic (EM) Spectrum	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Identify the different waves in the electromagnetic spectrum. Label the electromagnetic spectrum to show changing wavelengths and frequency. Use wave speed equation to calculate wave speeds using standard form. **Describe how electromagnetic waves are produced – HT only**	English - describing and explaining Maths – using wave speed equation. Calculations using standard form.

			Prove: Peer assessed exam questions. Ponder: Review and correct work.	
	What are the uses and hazards of the EM spectrum?	T6L6 – Uses and hazards of the EM spectrum	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Compare the uses and hazards of the different electromagnetic waves. Explain dangers linked to ionising radiation. Prove: Peer assessed extended writing question. Ponder: Review and correct work.	English - describing and explaining and extended answer
	How does infrared interact with different surfaces?	T6L7 – Infra-red radiation on surfaces Required Practical	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Demonstration of Leslie cube and detecting infrared emission. Compare absorbing radiation and emitting radiation. Complete practical to find the best absorber and emitter of infrared radiation. Prove: Peer assessed conclusion for practical work. Ponder: Review and correct work.	English - describing and explaining and extended answer Maths – calculating temperature changes
	How does light travel through a glass block?	T6L8 – Refraction Required Practical	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what refraction of light is and explain using particle models how it works. Draw and label key features of a ray diagram. Complete the required practical to measure refracted angles from different angles of incidence. Prove: Self assessed extended writing question. Ponder: Review and correct work.	English - describing and explaining and extended answer Maths – measuring angles
	How does light interact with a convex lens?	T6L10a – Convex Lenses ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what a lens is and identify different examples of lenses. Draw and label a convex lens to show how it works. Complete practical work to find the	English - describing and explaining and extended answer Maths – magnification calculations

			focal point of a convex lens. Draw and label ray diagrams for convex lenses and calculate magnification. Describe the image produced in different examples. Prove: Self assessed summary questions. Ponder: Review and correct work.	
	How does light interact with a concave lens?	T6L10b – Diverging Lenses ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Draw and label a concave lens to show how it works. Complete practical work to find the focal point of a concave lens. Draw and label ray diagrams for concave lenses and calculate magnification. Compare the images produced in different examples to those of convex lenses. Prove: Self assessed summary questions. Ponder: Review and correct work.	English - describing and explaining and extended answer Maths – magnification calculations
	What determines the colour of a surface?	T6L11 – Colour ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Identify sources of light compared to objects reflecting light. Describe the differences between transparent, translucent and opaque materials. Practical using a prism to split white light and label the visible spectrum of light. Create ray diagrams to show reflections and absorption of different colours. Investigate how filters work and how objects will appear different when viewed through different combinations of colour filters. Prove: Peer assessed exam questions. Ponder: Review and correct work.	English - describing and explaining and extended answer
	What is meant by black body radiation?	T6L12 – Black Body Radiation ***(HT Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Create a definition for a perfect black body based on infrared radiation. Using diagrams describe	English - describing and explaining

			how the temperature of the Earth changes between night and day. Prove: Self assessed summary questions. Ponder: Review and correct work.	
	How can I improve my knowledge of this topic?	T6L13 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T6L14 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Topic 7 – Magnetism and Electromagnetism				
Topic 7 – Magnetism and Electromagnetism	***What is a permanent and induced magnet?***	T7L1 - Magnets	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what magnetism is and what a magnetic field is. Practical to investigate magnetic fields around different combinations of magnets. Use a plotting compass to show the direction of a magnetic field around a bar magnet. Compare permanent and induced magnets. Prove: Self assessed exam questions. Ponder: Review and correct work.	English for describing and explaining
	How do we increase the strength of an electromagnet?	T7L2 – Electromagnets and the Motor Effect	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what an electromagnet is and draw magnetic fields around a wire, a solenoid and a circular coil. Practical to investigate the different factors that can affect the strength of an electromagnet. Describe how a relay switch works. Prove: Teacher assessed extended answer exam question. Ponder: Review and correct work.	English for describing and explaining
	How is magnetic flux density calculated?	T7L3 – Magnetic Flux density ***(HT only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions	English - describing and explaining

			Practise: Describe what magnetic flux is linked to the strength of magnetic fields. Use and rearrange the equation to calculate magnetic flux density. Practical to investigate how the current can affect the magnetic flux. Prove: Peer assessed calculation exam questions. Ponder: Review and correct work.	Maths – calculating magnetic flux
	How is movement created from a magnet and electric current?	T7L4 – Using the Motor Effect ***(HT only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what the motor effect is and what can happen when magnetic fields are combined. Use Fleming's left-hand rule to work out the direction of the force. Describe how a loudspeaker works using a motor. Prove: Peer assessed extended answer exam question. Ponder: Review and correct work.	English - describing and explaining and extended answers
	How is a current generated using induced potential?	T7L5 – Induced Potential ***(HT Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what the generator effect is and how changing current is able to alternate. Practical to investigate different examples and how they affect potential difference. Compare dynamos and alternators. Prove: Self assessed summary questions. Ponder: Review and correct work.	English - describing and explaining
	What do step-up and step-down transformers do?	T7L6 – Transformers ***(HT Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the function and process of transformers. Compare step-up and step-down transformers. Use the equation to calculate voltage of transformers. Use calculations to work out the efficiency of transformers. Prove: Peer assessed calculation questions.	English - describing and explaining Maths – transformer calculations

			Ponder: Review and correct work.	
	How is power lost in the National Grid?	T7L7 – The National Grid ***(HT Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the role of transformers in the National Grid. Practical investigation using model transformers. Use power calculations to calculate power loss and link to use of transformers. Prove: Self assessed exam questions. Ponder: Review and correct work.	English - describing and explaining Maths – power calculations
	How can I improve my knowledge of this topic?	T7L8 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T7L9 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Topic 8 – Space (Separate Physics only)				
Topic 8 – Space (Separate Physics only)	***What celestial bodies are in our solar system?***	T8L1 – Solar system ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Observe the scale of the planets in our solar system and identify key features of the 8 planets. Label a diagram of the solar system to identify the order of the planets and other key features. Compare planets and dwarf planets. Identify examples of natural and artificial satellites, describing uses of artificial ones. Prove: Self assessed summary questions. Ponder: Review and correct work.	
	What is the sequence of our stars life cycle?	T8L2 – Star Life-Cycles ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Observe the scale of stars compared to planets and other objects in the universe. Describe and compare the life cycle of stars that are similar to our sun with other massive stars.	English - describing and explaining and extended answers. Maths – data on magnitude of stars

			Prove: Self assessed extended exam question. Ponder: Review and correct work.	
	What are the factors that affect circular motion?	T8L3 – Circular Motion ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what causes circular motion. Practical to investigate factors that can affect orbital motion. Calculate speed and radius of orbital motion Prove: Peer assessed exam questions. Ponder: Review and correct work.	English - describing and explaining Maths – calculation of speed and radius
	What is the evidence of the big bang?	T8L4 – Observing the Universe ***(Sep Phys only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the doppler effect. Draw a model to represent the doppler effect. Compare red shift and blue shift. Describe the big bang and evidence that supports it. Prove: Peer assessed exam question. Ponder: Review and correct work.	English - describing and explaining and extended writing answer
	How can I improve my knowledge of this topic?	T8L5 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T8L6 – End of topic test	Complete end of topic test using past GCSE exam questions.	

Short Term Planning
Individual lesson resources and assessments to include high quality texts and images. Lessons should promote the explicit teaching of vocabulary and give opportunities to speak, read and write extensively using high-level subject vocabulary. Core numeracy skills should be incorporated into lessons where they can be covered in a real world context.
Opportunities should be created to support the wider curriculum:

- PSHE / RSE
- Careers
- Citizenship and British Values
- Financial Education

Planning should be shared across the department.

Teachers can adapt lessons to match needs to students.