Curriculum Planning KS4 Chemistry

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 chemistry 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 Chemistry 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.

Chemistry
Skills and Knowledge learned by the end of year 9

Topic 1 'Atoms and the Periodic Table'

- 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 most 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 relative charges and approximate relative masses of protons, neutrons and electrons
- calculate numbers of protons, neutrons and electrons in atoms and ions, given atomic number and mass number of isotopes.
- explain how the position of an element in the Periodic Table is related to the arrangement of electrons in its atoms and hence to its atomic number
- explain in terms of isotopes how this changes the arrangement proposed by Mendeleev
- use the names and symbols of the first 20 elements, Groups 1, 7 and 0 and other common elements from a supplied Periodic Table to write formulae and balanced chemical equations where appropriate
- explain how the reactions of elements are related to the arrangement of electrons in their atoms and hence to their atomic number
- recall the simple properties of Groups 1, 7 and 0
- explain how observed simple properties of Groups 1,7 and 0 depend on the outer shell of electrons of the atoms and predict properties from given trends down the groups
- predict possible reactions and probable reactivity of elements from their positions in the Periodic Table
- describe metals and non-metals and explain the differences between them on the basis of their characteristic physical and chemical properties explain how the atomic structure of metals and non-metals relates to their position in the Periodic Table.
- recall the general properties of transition metals (melting point, density, reactivity, formation of coloured ions with different charges and uses as catalysts) and exemplify these by reference to a small number of transition metals. **(CHEMISTRY ONLY)**

Topic 2 'Structure and Bonding'

- recall and explain the main features of the particle model in terms of the states of matter and change of state, distinguishing between physical and chemical changes
- explain the limitations of the particle model in relation to changes of state when particles are represented by inelastic spheres
- use ideas about energy transfers and the relative strength of chemical bonds and intermolecular forces to explain the different temperatures at which changes of state occur
- use data to predict states of substances under given conditions.
- describe and compare the nature and arrangement of chemical bonds in ionic compounds, simple molecules, giant covalent structures, polymers and metals
- explain chemical bonding in terms of electrostatic forces and the transfer of sharing of electrons
- construct dot and cross diagrams for simple ionic and covalent substances
- describe the limitations of particular representations and models to include dot and cross diagrams, ball and stick models and two and three dimensional representations
- explain how the bulk properties of materials are related to the different types of bonds they contain, their bond strengths in relation to intermolecular forces and the ways in which their bonds are arranged, recognising that the atoms themselves do not have these properties.
- recall that carbon can form four covalent bonds
- explain that the vast array of natural and synthetic organic compounds occur due to the ability of carbon to form families of similar compounds, chains and rings
- explain the properties of diamond, graphite, fullerenes and graphene in terms of their structures and bonding.
- compare ‘nano’ dimensions to typical dimensions of atoms and molecules **(CHEMISTRY ONLY)**
- describe the surface area to volume relationship for different-sized particles and describe how this affects properties **(CHEMISTRY ONLY)**
- describe how the properties of nanoparticulate materials are related to their uses
- explain the possible risks associated with some nanoparticulate materials. **(CHEMISTRY ONLY)**

Skills and Knowledge learned by the end of year 10

Topic 3 ‘Quantitative Chemistry’

- use chemical symbols to write the formulae of elements and simple covalent and ionic compounds
- deduce the empirical formula of a compound from the relative numbers of atoms present or from a model or diagram and vice versa
- use the names and symbols of common elements and compounds and the principle of conservation of mass to write formulae and balanced chemical equations and half equations

- use the formulae of common ions to deduce the formula of a compound and write balanced ionic equations.
- Conservation of mass and the quantitative interpretation of balanced equations
- • recall and use the law of conservation of mass
- explain any observed changes in mass in non-enclosed systems during a chemical reaction and explain them using the particle model
- calculate relative formula masses of species separately and in a balanced chemical equation.
- recall and use the definitions of the Avogadro constant (in standard form) and of the mole
- explain how the mass of a given substance is related to the amount of that substance in moles and vice versa
- deduce the stoichiometry of an equation from the masses of reactants and products and explain the effect of a limiting quantity of a reactant
- use a balanced equation to calculate masses of reactants or products
- explain how the mass of a solute and the volume of the solution is related to the concentration of the solution.
- calculate the percentage yield of a reaction product from the actual yield of a reaction **(CHEMISTRY ONLY)**
- calculate the theoretical amount of a product from a given amount of reactant
- define the atom economy of a reaction **(CHEMISTRY ONLY)**
- calculate the atom economy of a reaction to form a desired product from the balanced equation **(CHEMISTRY ONLY)**
- explain why a particular reaction pathway is chosen to produce a specified product given appropriate data such as atom economy (if not calculated), yield, rate, equilibrium position and usefulness of by-products. **(CHEMISTRY ONLY)**
- describe the relationship between molar amounts of gases and their volumes and vice versa, and calculate the volumes of gases involved in reactions, using the molar gas volume at room temperature and pressure (assumed to be 24dm3) **(CHEMISTRY ONLY)**
- explain how the concentration of a solution in mol/dm3 is related to the mass of the solute and the volume of the solution **(CHEMISTRY ONLY)**
- explain the relationship between the volume of a solution of known concentration of a substance and the volume or concentration of another substance that react completely together **(CHEMISTRY ONLY)**

Topic 4 Chemical changes

- describe the physical states of products and reactants using state symbols (s, l, g and aq).
- recall that acids react with some metals and with carbonates and write equations predicting products from given reactants
- recall that acids form hydrogen ions when they dissolve in water and solutions of alkalis contain hydroxide ions
- recall that relative acidity and alkalinity are measured by pH

- describe neutralisation as acid reacting with alkali to form a salt plus water
- recognise that aqueous neutralisation reactions can be generalised to hydrogen ions reacting with hydroxide ions to form water
- use and explain the terms dilute and concentrated (amount of substance) and weak and strong (degree of ionisation) in relation to acids
- recall that as hydrogen ion concentration increases by a factor of ten the pH value of a solution decreases by a factor of one
- describe neutrality and relative acidity and alkalinity in terms of the effect of the concentration of hydrogen ions on the numerical value of pH (whole numbers only).
- reactivity series of metals as the tendency of a metal to form its positive ion
- explain how the reactivity of metals with water or dilute acids is related to the tendency of the metal to form its positive ion
- deduce an order of reactivity of metals based on experimental results.
- describe electrolysis in terms of the ions present and reactions at the electrodes
- recall that metals (or hydrogen) are formed at the cathode and non-metals are formed at the anode in electrolysis using inert electrodes
- predict the products of electrolysis of binary ionic compounds in the molten state
- describe competing reactions in the electrolysis of aqueous solutions of ionic compounds in terms of the different species present.
- explain reduction and oxidation in terms of loss or gain of oxygen, identifying which species are oxidised and which are reduced
- explain reduction and oxidation in terms of gain or loss of electrons, identifying which species are oxidised and which are reduced.

Topic 5 ‘Energy in Reaction’

- distinguish between endothermic and exothermic reactions on the basis of the temperature change of the surroundings
- draw and label a reaction profile for an exothermic and an endothermic reaction, identifying activation energy
- explain activation energy as the energy needed for a reaction to occur
- calculate energy changes in a chemical reaction by considering bond making and bond breaking energies.
- recall that a chemical cell produces a potential difference until the reactants are used up
- evaluate the advantages and disadvantages of hydrogen/oxygen and other fuel cells for given uses. **(CHEMISTRY ONLY)**

Topic 6 ‘Rates of Reaction’

- Factors that influence the rate of reaction, including catalysts
- suggest practical methods for determining the rate of a given reaction
- interpret rate of reaction graphs
- describe the effect of changes in temperature, concentration, pressure, and surface area on rate of reaction

- explain the effects on rates of reaction of changes in temperature, concentration and pressure in terms of frequency and energy of collision between particles
- explain the effects on rates of reaction of changes in the size of the pieces of a reacting solid in terms of surface area to volume ratio
- describe the characteristics of catalysts and their effect on rates of reaction
- identify catalysts in reactions
- explain catalytic action in terms of activation energy
- recall that enzymes act as catalysts in biological systems
- recall that some reactions may be reversed by altering the reaction conditions
- recall that dynamic equilibrium occurs when the rates of forward and reverse reactions are equal
- predict the effect of changing reaction conditions (concentration, temperature and pressure) on equilibrium position and suggest appropriate conditions to produce a particular product.

Skills and Knowledge learned by the end of year 11

Topic 7 'Organic Chemistry'

- recall that crude oil is a main source of hydrocarbons and is a feedstock for the petrochemical industry
- explain how modern life is crucially dependent upon hydrocarbons and recognise that crude oil is a finite resource.
- describe and explain the separation of crude oil by fractional distillation
- describe the fractions as largely a mixture of compounds of formula CnH2n+2 which are members of the alkane homologous series
- describe the production of materials that are more useful by cracking.
- recognise functional groups and identify members of the same homologous series
- name and draw the structural formulae, using fully displayed formulae, of the first four members of the straight chain alkanes, alkenes, alcohols and carboxylic acids. **(CHEMISTRY ONLY)**
- predict the formulae and structures of products of reactions (combustion, addition across a double bond and oxidation of alcohols to carboxylic acids) of the first four and other given members of these homologous series. **(CHEMISTRY ONLY)**
- recall that it is the generality of reactions of functional groups that determine the reactions of organic compounds. **(CHEMISTRY ONLY)**
- recall the basic principles of addition polymerisation by reference to the functional group in the monomer and the repeating units in the polymer **(CHEMISTRY ONLY)**
- deduce the structure of an addition polymer from a simple alkene monomer and vice versa **(CHEMISTRY ONLY)**

- explain the basic principles of condensation polymerisation by reference to the functional groups of the monomers, the minimum number of functional groups within a monomer, the number of repeating units in the polymer, and simultaneous formation of a small molecule **(CHEMISTRY ONLY)**
- recall that DNA is a polymer made from four different monomers called nucleotides and that other important naturally-occurring polymers arew based on sugars and amino-acids. **(CHEMISTRY ONLY)**

Topic 8 'Analysis'

- describe tests to identify selected gases including oxygen, hydrogen, carbon dioxide and chlorine.
- explain what is meant by the purity of a substance, distinguishing between the scientific and everyday use of the term 'pure
- explain that many useful materials are formulations of mixtures
- describe, explain and exemplify the processes of filtration, crystallisation, simple distillation, and fractional distillation
- recall that chromatography involves a stationary and a mobile phase and that separation depends on the distribution between the phases
- interpret chromatograms, including measuring Rf values
- suggest suitable purification techniques given information about the substances involve
- use melting point data to distinguish pure from impure substances
- suggest chromatographic methods for distinguishing pure from impure substances.
- describe tests to identify aqueous cations and aqueous anions **(CHEMISTRY ONLY)**
- identify species from test results **(CHEMISTRY ONLY)**
- interpret flame tests to identify metal ions, including the ions of lithium, sodium, potassium, calcium and copper **(CHEMISTRY ONLY)**
- describe the advantages of instrumental methods of analysis (sensitivity, accuracy and speed) **(CHEMISTRY ONLY)**
- interpret an instrumental result given appropriate data in chart or tabular form, **(CHEMISTRY ONLY)**

Topic 9 Atmosphere

- interpret evidence for how it is thought the atmosphere was originally formed
- describe how it is thought an oxygen-rich atmosphere developed over time.
- describe the greenhouse effect in terms of the interaction of radiation with matter
- evaluate the evidence for additional anthropogenic causes of climate change including the correlation between change in atmospheric carbon dioxide concentration and the consumption of fossil fuels, and describe the uncertainties in the evidence base
- describe the potential effects of increased levels of carbon dioxide and methane on the Earth's climate and how these effects may be mitigated, including consideration of scale, risk and environmental implications.

- describe the major sources of carbon monoxide, sulfur dioxide, oxides of nitrogen and particulates in the atmosphere and explain the problems caused by increased amounts of these substances.

Topic 10 Earth Materials

- describe the principal methods for increasing the availability of potable water in terms of the separation techniques used, including ease of treatment of waste, ground and salt water
- describe the basic principles in carrying out a life-cycle assessment of a material or product
- interpret data from a life-cycle assessment of a material or product
- describe a process where a material or product is recycled for a different use, and explain why this is viable
- evaluate factors that affect decisions on recycling
- explain, using the position of carbon in the reactivity series, the principles of
- industrial processes used to extract metals, including extraction of a non-ferrous metal
- explain why and how electrolysis is used to extract some metals from their ores
- evaluate alternative biological methods of metal extraction (bacterial and phytoextraction).
- describe the conditions which cause corrosion and the process of corrosion, and explain how mitigation is achieved by creating a physical barrier to oxygen and water and by sacrificial protection **(CHEMISTRY ONLY)**
- describe the composition of some important alloys in relation to their properties and uses **(CHEMISTRY ONLY)**
- compare quantitatively the physical properties of glass and clay ceramics, polymers, composites and metals **(CHEMISTRY ONLY)**
- explain how the properties of materials are related to their uses and select **(CHEMISTRY ONLY)**
- interpret graphs of reaction conditions versus rate **(CHEMISTRY ONLY)**
- explain the trade-off between rate of production of a desired product and position of equilibrium in some industrially important processes **(CHEMISTRY ONLY)**
- explain how the commercially used conditions for an industrial process are related to the availability and cost of raw materials and energy supplies, control of equilibrium position and rate. **(CHEMISTRY ONLY)**
- explain the importance of the Haber process in agricultural production **(CHEMISTRY ONLY)**
- recall the importance of nitrogen, phosphorus and potassium compounds in agricultural production **(CHEMISTRY ONLY)**
- describe the industrial production of fertilisers as several integrated processes using a variety of raw materials and compare with laboratory syntheses. **(CHEMISTRY ONLY)**
- compare the industrial production of fertilisers with laboratory syntheses of the same products. **(CHEMISTRY ONLY)**

Long term planning grid

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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 Atomic Structure and the Periodic Table				
Unit 1 Atomic Structure and the Periodic Table	***What makes up an atom?***	T1L1: Atomic structure	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Label diagram of an atom and identify properties of the 3 types of sub-atomic particle. Use the periodic table to work out the number of sub-atomic particles in different elements. Prove: Self-assessed exam question Ponder: Review and correct work	Maths - numbers of sub-atomic particles.

	How was the atom model developed?	T1L2: History of the Atom	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Create a timeline to show the key developments over time on the structure of the atom. Describe Rutherford's experiment and be able to draw conclusions from it to show how the theory of the model has changed. Prove: Self-assessed extended writing exam question Ponder: Review and correct work	History – creating timeline of historical events English – describing and explaining different models and experiments
	What is an isotope and how can we calculate the relative atomic mass?	T1L2b: Isotopes	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Define an isotope and describe how the structure is different. Calculate relative atomic masses from abundance of different isotopes. Prove: Teacher-assessed extended writing exam question Ponder: Review and correct work	Maths - relative atomic mass calculations English – extended writing exam question
	How do you write out word equations for chemical reactions?	T1L3: Chemical reactions	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Recall the difference between elements and compounds. Name different compounds using the elements it is formed from. Construct word equations from written descriptions of reactions. Prove: Peer-assessed exam question Ponder: Review and correct work	English (Literacy) - reading and interpreting the descriptions of chemical reactions
	How are electrons arranged around the nucleus?	T1L4: Electronic configuration	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Using the electronic configuration rules, complete the examples for the first 20 elements. Prove: Self-assessed exam question Ponder: Review and correct work	Maths - writing electronic configurations in numerical form

	What is the difference between atoms, compounds and mixtures?	T1L5 – Atoms, Compounds and Mixtures	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Use particle diagrams to show the difference between elements, compounds and mixtures. Prove: Use the periodic table to name elements and use symbols Ponder: Review and correct work	English - describing and explaining particle models
	How can mixtures be separated?	T1L6 – Separating mixtures	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Using information provided, describe the 5 different separation techniques and identify equipment needed. Prove: Teacher-assessed extended writing exam question Ponder: Review and correct work.	English - describing and explaining techniques and extended exam question
	How were the elements ordered?	T1L7/8 – Periodic Table History	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Using information provided, create a timeline to show how the periodic table has developed over time. Prove: Peer-assessed extended writing exam question Ponder: Review and correct work.	History – creating timeline of historical events English – describing and explaining different models
	What is the difference between metals and non-metals?	T1L9 – Metals and Non-metals	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Observe examples of metals and non-metals and identify key properties of each Prove: Self-assessed word equations for reactions of metals and non-metals Ponder: Review and correct work.	English – describing properties of different types of elements.
	What are the chemical and physical properties of alkali metals?	T1L10 – Group 1 Alkali metals	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Observe reactions of group 1 metals and water, describe and write word and symbol equations.	English - describing and explaining reactions

			Prove: Peer assessed exam style question Ponder: Review and correct work.	
	What are the chemical and physical properties of the Halogens?	T1L11 - Halogens	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Using information, describe properties and uses of the halogens. Practical completing displacement reactions of halogens Prove: Conclusion from experiment linking reactivity to results and writing word equations. Ponder: Review and correct work.	English - describing and explaining reactions
	What are the chemical and physical properties of Noble gases?	T1L12 – Noble gases	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Using information, describe properties and uses of the noble gases. Draw a bar graph to show relative atomic mass of noble gases. Complete questions on properties of noble gases. Prove: Self assessed exam style question Ponder: Review and correct work.	English - describing and explaining Maths – using data to draw a graph.
	What properties do transition metals have?	T1L14 – Transition Metals ***(Sep Chem only)***	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Describe the properties of transition metals and give some examples of uses. Identify the different ions transition metals can form. Prove: Peer assessed extended writing exam style question Ponder: Review and correct work.	English - describing and explaining
	How can I improve my knowledge of this topic?	T1L15 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T1L16 – End of topic test	Complete end of topic test using past GCSE exam questions.	

Unit 2 Bonding, Structure and Properties of Matter

Unit 2 Bonding, Structure and Properties of Matter	***How do atoms become more stable?***	T2L1 – Atoms to ions	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Identify which type of ion an element will form based on the electronic structure. Draw examples of dot and cross diagrams for different ions and give electronic configurations of ions. Prove: Peer assessed extended writing exam style question Ponder: Review and correct work.	English - describing and explaining Maths – representing numerical electronic configurations
	How is ionic bonding represented?	T2L2 – Ionic bonding	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Complete dot and cross diagrams to show a range of ionic bonding examples. Break down exam questions to describe how an ionic bond forms. Prove: Self assessed exam style questions. Ponder: Review and correct work.	English - describing and explaining How the bond forms
	What are the properties of ionic bonded substances?	T2L3 – Ionic properties	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Complete practical investigation into properties of ionic compounds. Complete summary of each property linked to the structure of the compound. Prove: Self assessed extended writing exam style questions. Ponder: Review and correct work.	English - describing and explaining Maths – reviewing data
	How do molecular substances form?	T2L4 – Molecular substances	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Complete dot and cross diagrams to show simple molecular bonding. Describe the properties of simple molecular compounds linked to their structure. Prove: Peer assessed extended writing exam style questions. Ponder: Review and correct work.	English - describing and explaining properties of compounds
	What are the	T2L5 – Metallic	Prepare: Knowledge recall questions Present: New information,	English - describing

	properties of metallic bonding?	bonding and alloys	video clip and key questions, tackle misconceptions Practise: Complete summary of the properties of metals and how they link to their structure and bonding. Give examples of uses of metals based on their properties. Prove: Peer assessed exam style questions. Ponder: Review and correct work.	and explaining properties and uses of metals
	What are the properties of giant structures?	T2L6 – Giant molecular	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Compare the different models used to represent molecules. Describe properties and structure of diamond, graphite and silicon dioxide. Describe uses and structure of fullerenes and nanotubes. Prove: Self assessed summary questions on properties. Ponder: Review and correct work.	English - describing and explaining
	What are the properties of a solid, liquid and a gas?	T2L7 – States of matter	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Compare the particle arrangements for solids, liquids and gases. Plot melting and boiling point data for a pure substance and describe the key points on the graph. Prove: Review limitations of particle models. Ponder: Review and correct work.	English - describing and explaining Maths – using data to plot a graph.
	What are the uses of nanoparticles?	T2L8 - Nanoparticles	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe properties and uses of nanoparticles. Calculate surface area to volume ratios. Understand some risks to use of nanoparticles. Prove: Peer assessed exam style question. Ponder: Review and correct work.	English - describing and explaining Maths – Surface area to volume ratio calculations
	How can I improve	T2L9 - Revision	Review of whole topic and revision activities ready for end of topic test	

	my knowledge of this topic?			
		T2L10 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Unit 3 Quantitative Chemistry				
Unit 3 Quantitative Chemistry	***How do we work out the masses of chemicals?***	T3L1a – Relative Formula Mass	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Interpret chemical formulae, use periodic table to calculate relative formula masses for a range of examples. Prove: Peer assessed exam style question. Ponder: Review and correct work.	English - describing and explaining Maths – Calculating relative formula masses
	What is the conservation of mass?	T3L1b – Conservation of mass	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Define law of conservation of mass. Practical thermal decomposition of copper carbonate and calculate CO_2 produced. Balancing chemical equations Prove: Self assessed balancing equations questions Ponder: Review and correct work.	English - describing and explaining Maths – calculations and balancing equations
	How is concentration of solutions calculated?	T3L2 – Concentration calculations	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe concentration of solutions in terms of solute particles. Describe how to change the concentration of a solution. Calculate concentration of solutions. Prove: Peer assessed concentration and mass of solute calculations. (Rearranging equation) Ponder: Review and correct work.	English - describing and explaining Maths – concentration calculations
	How do you calculate the amount of	T3L3 – Moles ***(HT only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what Avogadro's number is. Complete mole	English - describing and explaining

	substances ?		calculations and rearranged equation calculations. Prove: Self assessed exam style question. Ponder: Review and correct work.	Maths – Moles calculations
	How is the mass of the product worked out?	T3L4 – Reacting Masses ***(HT only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe steps to calculate reacting masses, balance equations and rearrange equation for calculations Prove: Peer assessed exam style questions. Ponder: Review and correct work.	English - describing and explaining Maths – reacting mass calculations
	How can we find which reactant is limiting a reaction?	T3L5 – Limiting and Excess reactants ***(HT only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Practical/demo to identify limiting reactants in reactions. Use balanced equations and calculations to identify the limiting reactant for example reactions. Prove: Self assessed exam style questions. Ponder: Review and correct work.	English - describing and explaining Maths – Limiting reactants calculations
	Why is it important to calculate the percentage of products formed?	T3L6 – Atom economy and percentage yield ***(Sep Chem only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe how atom economy can be 100%, identify ways percentage yield of reactions is not 100% of the theoretical yield. Complete % yield and atom economy calculations. Prove: Self assessed exam style questions. Ponder: Review and correct work.	English - describing and explaining. Maths - % yield and atom economy calculations
	How do you measure volumes of reactants using titration?	T3L7a – Titration method RP ***(Sep Chem only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe method for carrying out a titration. Complete the required practical titration. Prove: Teacher assessed exam style questions. Ponder: Review and correct work.	English - describing and explaining

	How do you calculate the concentration of unknown chemicals?	T3L7b – Titration calculations ***(Sep Chem HT only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Carry out titration calculations to determine an unknown concentration of solution Prove: Self assessed exam style questions. Ponder: Review and correct work.	Maths – Titration calculations
	How is gas volume calculated from reactions?	T3L8 – Gas Volumes ***(Sep Chem HT only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe standard conditions for gas constants. Complete molar gas calculations Prove: Peer assessed exam style questions. Ponder: Review and correct work.	English - describing and explaining Maths – Gas volume calculations
	How can I improve my knowledge of this topic?	T3L9 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T3L10 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Unit 4 – Chemical changes				
Unit 4 – Chemical changes	***What is the order of reactivity of different elements?***	T4L1 – Reactivity series	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Observe and describe reactions of metals and water and write word equations for the reactions. Complete practical with metals and acid. Describe order of reactivity of the range of metals used. Prove: Peer assessed exam style questions. Ponder: Review and correct work.	English - describing and explaining
	How do metals react with compounds?	T4L2 – Metals and displacement	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Complete practical on displacement reactions with metals	English - describing and explaining Maths – writing

			and metal salt solutions. Write word equations and use results to identify order of reactivity. Use reactivity series to predict example reactions. Prove: Self assessed exam style questions including word and symbol equations. Ponder: Review and correct work.	balanced symbol equations
	How are metals extracted from their ores?	T4L3 – Extraction of metals	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Collect data on discovery of different metals. Describe how metal oxides can be reduced by carbon and create word equations for reactions. Prove: Self assessed exam style questions. Ponder: Review and correct work.	English - describing and explaining Maths – Gathering and presenting data History – researching discovery dates for different metals.
	What is a REDOX reaction?	T4L4 – Oxidation and reduction ***(HT only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what happens during oxidation and reduction reactions in terms of oxygen and electrons. Write half equations for redox reactions. Prove: Self assessed displacement reaction half equation questions. Ponder: Review and correct work.	English - describing and explaining Maths – Balancing ionic equations
	What is the difference between acids and alkalis?	T4L5 – Acids and Alkalis	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the pH scale with key terms, complete practical to investigate pH of different substances using universal indicator. Describe concentrated and dilute acids and alkalis. Describe strong and weak acids and alkalis. Prove: Teacher assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining Maths – using pH scale

	How are salts formed from acids and bases	T4L6 – Metals and acids	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Naming salts based on metal and acid reactions. Complete word and symbol equations. ***(HT complete ionic equations)*** Describe the method to make a metal salt from these reactions. Prove: Peer assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining and extended writing answer
	How are salts formed from soluble bases? (hydroxides)	T4L7 – Making salts from soluble bases (required practical)	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what a salt is. Complete required practical to make a salt from an acid and alkali solution. Complete word equations to identify metal salts formed. Prove: Self assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining and extended writing answer
	How are salts made from insoluble bases (metal oxides)?	T4L8a – Making salts from insoluble salts (oxides)	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Describe the method used to make a salt from an acid and insoluble metal oxide. Complete practical to make a salt crystal from and acid and metal oxide. Complete word equations to identify metal salts formed. Prove: Peer assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining and extended writing answer
	How do we make a soluble salt from an insoluble base (metal carbonate)?	T4L8b - Making salts from insoluble salts (carbonates)	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Plan the method used to make a salt from and acid and insoluble metal carbonate. Once reviewed, complete the practical to make salt crystals. Complete word equations to identify metal salts formed.	English - describing and explaining and extended writing answer

			Prove: Self assessed review questions. Ponder: Review and correct work.	
	How does electrolysis split salts back into elements?	T4L9 - Electrolysis	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the process of electrolysis, draw and label key pieces of equipment for the process. Describe what happens at each electrode for a molten ionic salt. ***(HT – complete half equations)*** Prove: Self assessed exam questions. Ponder: Review and correct work.	English - describing and explaining Maths – Balancing half equations
	What is extracted from aqueous salt solutions?	T4L10 – Electrolysis Required Practical	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the process of electrolysis of aqueous ionic compounds. Use the reactivity series to describe which products are formed at each electrode for an ionic salt solution. Prove: Teacher assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining Maths – Balancing half equations
	How is aluminium extracted?	T4L11 – Aluminium extraction	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the process of electrolysis of aluminium from bauxite. Describe what is produced at each electrode and explain why carbon electrodes need to be replaced. Prove: Peer assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining
	How is reduction and oxidation shown in electrolysis ?	T4L12 – Half equations ***(HT only)***	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Recap of REDOX reactions. Describe redox reactions in electrolysis. Write balanced half equations to show reactions taking place.	English - describing and explaining Maths – Balancing half equations

			Prove: Self assessed exam questions. Ponder: Review and correct work.	
	How can I improve my knowledge of this topic?	T4L14 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T4L15 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Unit 5 – Energy changes				
Unit 5 – Energy changes	***What is an endothermic and exothermic reaction?***	T5L1 – Energy in reactions	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the differences between endothermic and exothermic reactions. Complete practical investigating which types of reaction happens by measuring temperature changes. Prove: Self assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining Maths – Calculating temperature changes and interpreting data.
	How do you interpret a reaction profile?	T5L2 – Energy profiles	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe, draw and label reaction profiles for endothermic and exothermic reactions. Explain what activation energy is and identify overall energy changes in reactions. Prove: Self assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining and extended exam question
	How do we measure energy change in reactions?	T5L3 – Energy Required Practical	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Recall different types of variables in experiments. Complete required practical to investigate temperature change in a neutralisation reaction. Write up a step-by-step detailed method for the investigation.	English - describing and explaining and extended writing answers

			Prove: Teacher assessed extended writing exam question. Ponder: Review and correct work.	
	What is an endothermic and exothermic reaction?	T5L4 – Bond energies ***(HT only)***	Prepare: Knowledge recall questions Present: New information and key questions, tackle misconceptions Practise: Describe bond breaking and bond making as endothermic or exothermic. Calculate bond energies for reactions to determine if they are overall endothermic or exothermic reactions. Prove: Self assessed calculation exam question. Ponder: Review and correct work.	English - describing and explaining Maths – Calculating bond energies in reactions
	How do you make a cell?	T5L5 – Chemical cells	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the different types of chemical cells and give examples of their uses. Practical to investigate which metal electrodes make the best chemical cell. Explain advantages and disadvantages of the different types of cells. Prove: Peer assessed exam question. Ponder: Review and correct work.	English - describing and explaining
	How can I improve my knowledge of this topic?	T5L6 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T5L7 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Topic 6 – Rate and extent of chemical change				
Topic 6 – Rate and extent of chemical	***How is the rate of reaction measured?***	T6L1 – Rate equation	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Compare different methods used to measure the rate of chemical reactions. Plot graphs and use the data and equation to calculate the rate of the reaction. ***(HT – draw tangent lines to calculate rate)***	English - describing and explaining Maths – plotting graphs and calculating rate of reaction

			Prove: Self assessed exam question. Ponder: Review and correct work.	
	How does temperature effect rate of reaction?	T6L2 – Surface area and temperature	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Identify 4 factors that affect the rate of a chemical reaction. Describe effect of surface area, calculate surface area to volume ratios. Practical to investigate the effect of temperature on the rate of a chemical reaction. Prove: Self assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining and extended answers. Maths – interpreting data
	How does number of particles effect the rate of reaction?	T6L3 – Concentration and rate required practical	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Complete required practical to investigate the effect of concentration on the rate of chemical reaction. Interpret graphs to describe trends and compare results. Describe the effect of pressure in gases on the rate of reaction. Prove: Teacher assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining and extended answers. Maths – interpreting data
	How does a catalyst change the rate of reaction?	T6L4 – Catalysts and rate of reaction	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Complete practical to investigate the effect of different catalysts on the rate of decomposition of hydrogen peroxide. Interpret results to identify the most effective catalyst for the reaction. Describe how a catalyst changes the rate of reaction linked to activation energy. Prove: Self assessed exam questions. Ponder: Review and correct work.	English - describing and explaining Maths – interpreting data

	What are reversible reactions?	T6L5 – Reversible reactions	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what a reversible reaction is and write word/symbol equations for examples. Define key terms involved in reversible reactions. ***HT – describe Le Chatelier's principles and how the different factors affect the equilibrium*** Prove: Peer assessed exam questions. Ponder: Review and correct work.	English - describing and explaining
	How can I improve my knowledge of this topic?	T6L6 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T6L7 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Topic 7 – Organic Chemistry				
Topic 7 – Organic Chemistry	***How is crude oil separated?***	T7L1 – Fractional distillation	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe how crude oil is formed. Describe the process of fractional distillation and identify uses for the different fractions of crude oil. Prove: Self assessed extended answer exam question. Ponder: Review and correct work.	English - describing and explaining and extended answers. Geography – formation of oil
	What is crude oil made of?	T7L2 - Alkanes	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what an alkane is and build models of the first four. Draw structural diagrams of the first 4 alkanes and work out the general formula for alkane molecules. Prove: Peer assessed exam questions. Ponder: Review and correct work.	English for describing and explaining Geography DT food
	What are the	T7L3 - Combustion	Prepare: Knowledge recall questions Present: New information,	English for describing

	products of combustion?		video clip and key questions, tackle misconceptions Practise: Describe how to test for the products of combustion. Explain the differences between complete and incomplete combustion. Evaluate efficiency of different fuels. Prove: Self assessed extended answer exam question. Ponder: Review and correct work.	and explaining
	How do we make long hydrocarbons useful?	T7L4 – Cracking	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe how cracking of long chain alkanes works. Identify products for examples of cracking. Explain why cracking is important related to the supply and demand of fuels from crude oil. Prove: Teacher assessed extended answer exam question. Ponder: Review and correct work.	English - describing and explaining and extended answers Business – Supply and demand
	What do alkenes look like and how are they tested?	T7L5 – Alkanes and alkenes	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the structure and general formula of alkenes. Describe the differences between alkanes and alkenes and the test for saturation. Prove: Peer assessed extended answer exam question. Ponder: Review and correct work.	English - describing and explaining
	How do alkanes react to form useful products?	T7L6 – Reactions of alkenes	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the combustion reactions of alkenes and compare to alkanes. Describe the addition reactions of alkenes with halogens, hydrogen and steam. Prove: Self assessed extended answer exam question. Ponder: Review and correct work.	English - describing and explaining
	What is the structure and properties	T7L7 – Alcohols, carboxylic	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions	English - describing and explaining

	of alcohols?	acids and esters ***(Sep Chem only)***	Practise: Describe the different functional groups for alcohols, esters and carboxylic acids. Describe how alcohols can be made by fermentation. Describe the reactions of alcohols with metals (sodium) Prove: Peer assessed exam question. Ponder: Review and correct work.	
	How is a polymer created from alkenes?	T7L8 – Addition polymerisation ***(Sep Chem only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe what polymers are and examples of their uses. Describe how polymers are formed by addition reactions of monomers. Identify monomers and polymers from structural formula. Prove: Peer assessed exam question. Ponder: Review and correct work.	English - describing and explaining
	How is a polymer created from alkenes?	T7L9 – Synthetic Polymers ***(Sep Chem HT only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Identify monomers and polymers from structural formula. Describe how polymers can be made from condensation polymerisation. Compare this method to addition polymerisation. Describe how polyester is made. Prove: Self assessed exam questions. Ponder: Review and correct work.	English - describing and explaining
	How are naturally occurring polymers formed?	T7L10 – Natural polymers ***(Sep Chem only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Identify examples of natural polymers and where they are found. Show how natural polymers starch, cellulose, proteins and DNA are formed from monomers. Prove: Self assessed exam questions. Ponder: Review and correct work.	English - describing and explaining

	How can I improve my knowledge of this topic?	T7L11 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T7L12 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Topic 8 – Chemical Analysis				
Topic 8 – Chemical Analysis	***What is a pure substance and how do we test it?***	T8L1 – Purity and formulations	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Recap elements, compounds and mixtures. Define pure and impure substances and link to boiling/melting points. Complete practical to investigate which sample of water is pure. Define what a formulation is and give examples of uses. Prove: Self assessed exam questions. Ponder: Review and correct work.	English - describing and explaining Maths – analysing data
	How do we test for hydrogen, chlorine, oxygen and carbon dioxide?	T8L2 – Identifying gases	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Complete practical to test for the different gases. Identify the positive results for each method. Prove: Peer assessed exam questions. Ponder: Review and correct work.	English - describing and explaining
	How does chromatography separate mixtures?	T8L3 – Chromatography Required Practical	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Complete the required practical to demonstrate the correct method for paper chromatography. Interpret results of chromatograms and calculate Rf values. Prove: Self assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining Maths – calculation of Rf values
	How do we identify positive	T8L4 – Analysis of positive ions	Prepare: Knowledge recall questions Present: New information,	English - describing and

	ions (Cation)?	***(Sep Chem only)***	video clip and key questions, tackle misconceptions Practise: Complete the required practical on flame testing metals. Identify the metal and the correct colours. Carry out precipitation tests used to identify metals. Write ionic equations to show reactions taking place. Prove: Peer assessed extended writing exam question. Ponder: Review and correct work.	explaining and extended writing answer Maths – balancing ionic equations
	How do we identify negative ions (Anion)?	T8L5 – Analysis of negative ions ***(Sep Chem only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the tests and results for identifying carbonate, halide and sulphate ions. Create ionic equations for testing negative ions. Prove: Self assessed summary exam questions. Ponder: Review and correct work.	English - describing and explaining Maths – balancing ionic equations
	How can metals ion be identified by instrumental analysis?	T8L6 – Instrumental analysis ***(Sep Chem only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the differences between qualitative and quantitative tests and give examples for each. Evaluate the effectiveness of instrumental analysis compared to traditional methods of analysis. Prove: Peer assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining
	How can I improve my knowledge of this topic?	T8L7 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T8L8 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Topic 9 – Chemistry of the Atmosphere				
Topic 9 – 1	***How did the atmosphere change?***	T9L1 – Evolution of the Atmosphere	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions	English - describing and explaining

			Practise: Compare data to show how the atmosphere on Earth has changed over millions of years. Create a timeline to highlight key points that caused significant changes to the atmosphere composition. Prove: Peer assessed extended writing exam question. Ponder: Review and correct work.	History – creating timeline Geography – Earth Atmosphere Maths – Analysis of data
	How is the climate warming up?	T9L2 – Global Warming	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Complete diagram to show the greenhouse effect. Identify factors that are increasing CO_2 in the atmosphere. Evaluate evidence for different scientific models. Prove: Self assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining Geography – Climate change
	What is Carbon Footprint and what can we do about it?	T9L3 – Carbon footprint	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe causes and effects of global warming. Identify different ways to reduce carbon and methane emissions. Describe problems that may prevent reducing carbon footprints. Prove: Teacher assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining Geography – Climate change and carbon footprint
	What is complete and incomplete combustion	T9L4 – Combustion and alternatives	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Identify different ways that air and water are being polluted. Describe causes and effects of acid rain. Compare complete and incomplete combustion and effects of other pollutants. Prove: Self assessed exam questions. Ponder: Review and correct work.	English - describing and explaining Geography – Climate change and pollutants
	How can I improve my	T9L5 - Revision	Review of whole topic and revision activities ready for end of topic test	

	knowledge of this topic?			
		T9L6 – End of topic test	Complete end of topic test using past GCSE exam questions.	
Topic 10 – Using Resources				
Topic 10 – Using Resources	***How do we obtain drinking water?***	T10L1 – Potable water	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Identify what makes water potable and compare to pure water. Describe different methods used to treat water and make it potable. Evaluate each method based on effectiveness, energy and cost. Prove: Self assessed extended writing exam questions. Ponder: Review and correct work.	English - describing and explaining Geography – Water sources
	How can we be more sustainable with Earth's resources?	T10L2 – Sustainable development	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Define the differences between finite and renewable resources and identify examples of each. Research and describe alternative solutions for using resources more sustainably. Prove: Self assessed exam questions. Ponder: Review and correct work.	English - describing and explaining Geography – Sustainability
	What is the purpose of an LCA?	T10L3 – Life cycle assessments	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the process of an LCA. Carry out an LCA to compare plastic and paper bags. Evaluate the LCA process to identify weaknesses in the system. Prove: Peer assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining Geography – Sustainability Business – evaluating models
	How is copper extracted from low grade ore?	T10L4 – Copper Extraction ***(HT only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Complete the practical to extract copper from ore (copper	English - describing and explaining Geography – Sustainability

			carbonate) using electrolysis. Describe ways that copper can be extracted from low-grade ores. Evaluate the methods of phytomining and bioleaching to extract copper Prove: Self assessed extended writing exam question. Ponder: Review and correct work.	
	How are alloys stronger than metals?	T10L5 – Alloys ***(Sep Chem only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Identify different examples of alloys and how they are used linked to their properties. Explain how the structure of alloys are different to metals. Evaluate uses of different steels based on the composition of carbon content. Prove: Peer assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining DT – Properties and uses of alloys
	How do you prevent metal from corroding?	T10L6 – Metal corrosion ***(Sep Chem only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Complete investigation into what causes iron to rust. Research and describe different ways that rusting of iron can be prevented. Prove: Self assessed extended writing exam question. Ponder: Review and correct work.	English - describing and explaining
	How are polymer properties determined by its structure?	T10L7 – Polymers ***(Sep Chem only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Compare the properties of thermosetting and thermosoftening polymers. Explain how their structure affects these properties. Give uses for each type of polymer based on their properties. Prove: Peer assessed summary exam question. Ponder: Review and correct work.	English - describing and explaining DT – Properties and uses of polymers
	What are the different uses of	T10L8 – Glass, ceramic and composites	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions	English - describing and explaining

	glass, ceramic and composites ?	***(Sep Chem only)***	Practise: Identify examples of composite materials and how their properties make them suitable for different uses. Complete practical to compare the strength of concrete and reinforced concrete Prove: Self assessed summary exam question. Ponder: Review and correct work.	DT – Properties and uses of composites
	What conditions are needed to make ammonia?	T10L9 – Haber Process ***(Sep Chem only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the steps involved in the Haber process. Evaluate the use of different conditions against the product yield to determine optimum conditions used. Using data explain why these conditions are used. Prove: Peer assessed exam questions. Ponder: Review and correct work.	English - describing and explaining Maths – interpret and evaluate data
	What do fertilizers contain?	T10L10 – NPK Fertiliser ***(Sep Chem only)***	Prepare: Knowledge recall questions Present: New information, video clip and key questions, tackle misconceptions Practise: Describe the different fertilisers produced from ammonia. Create word and symbol equations for the reactions. Evaluate why fertilisers are important to the farming industry. Prove: Self assessed exam questions. Ponder: Review and correct work.	English - describing and explaining Geography – crop growth
	How can I improve my knowledge of this topic?	T10L11 - Revision	Review of whole topic and revision activities ready for end of topic test	
		T10L12 – 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.