Curriculum Planning Template

Subject:	Chemistry	Year	10	Ability	All

Topic	Quantitative Chemistry	Chemical Changes	Energy Changes	The Rate and Extent of Chemical Change	Organic Chemistry
Students will learn…	How to apply chemical measurements, the conversation of mass and the quantitative interpretation of chemical equations to unfamiliar situations	How to predict the products of specific and unfamiliar chemical reactions in the context of oxidation, reduction and redox How to carry out chemical reactions including electrolysis, titrations, and the formation of salts.	How exothermic and endothermic reactions influence the temperature of the surroundings. How energy changes in a chemical reaction can be measured practically	How the particle model and collision theory can be used to explain changes in rate How variables can influence changes in reversible reactions How rates of reaction can be measured practically	How to explain how crude oil is formed, separated and used. How hydrocarbons react and behave
What Golden Knowledge will pupils learn and remember?	Students understand that mass cannot be gained or lost in a chemical reaction in order to carry out simple calculations involving missing masses. Students understand and calculate relative formula masses in order to work out Mr values and to carry out more complex calculations involve the mole. Students understand how to calculate moles and understand that this is a measure of the amount of a substance in order to carry out more complex calculations involving reacting masses, percentage yield, limiting reactants and atom economy. Students calculate the concentrations of solutions in g/dm3 and mol/dm3 in order to explain how the concentration of a solution relates to the mass of solute and the volume of solution. Students understand that one mole of gas occupies 24dm3 of space in order to calculate the space occupied by a given amount of gaseous substance.	Students understand that metals react with oxygen in order to write simple oxidation equations Students have a knowledge of the reactivity series and how to use it in order to make predictions about the identities of elements such potassium, zinc, calcium, magnesium, iron and copper that will displace others from their compounds. Pupils have an understanding of how metals react with water or acids in order to explain the tendency of a metal to form a positive ion and to deduce the order of reactivity based on experimental data. Pupils have a knowledge of how the reactivity series can be used to predict if metals can be reduced by carbon in order to give details about the types of processes used to extract named metals. Pupils have a knowledge of metal extraction processes in order to interpret or evaluate specific metal extraction processes when given information or to identify the substances which are oxidised and reduced in a chemical reaction. Students understand how to write ionic equations and half equations in order to help them explain the reduction and oxidation processes that occur during named and unfamiliar reactions Students understand how named metals react with common acids and how to write symbol, ionic and half equations for these reactions in order to explain that they are redox reactions and identify the species that are oxidised and reduced. Students understand that acids are neutralised by metal oxides, metal hydroxides and carbonates in order to predict products from given reactants. Students understand that acids can react with metal oxides and metal carbonates to produce soluble salts in order to write equations for these reactions and to describe the practical processes behind the synthesis of these salts. Students know how titrations can be carried out to determine the volume or concentration of an unknown acid. Pupils know the ions produced by acids and bases and use this to help explain how neutralisation occurs using ionic equations.	Students understand that energy is conserved in chemical reactions in order to explain that the energy in the universe at the end of the chemical reaction is the same as energy at the start. Students understand that an exothermic reaction transfers energy to the surroundings in order to explain that the temperature of these (and named reactions such as combustion) reactions increases Students understand that an endothermic reaction absorbs energy from the surroundings in order to explain that the temperature of these reactions (and named reactions such as thermal decomposition) decreases. Pupils understand the concept of a reaction profile in order to draw fully labelled profiles for exothermic and endothermic reactions Students understand how to calculate energy changes in reactions when given bond energy values in order to determine if reactions are exothermic or endothermic. Pupils understand the concept of a chemical cell and fuel cell in order to explain that non-rechargeable cells stop when one of the reactants has been used up and rechargeable cells can be reused because the chemical reaction is reversible. Pupils understand how to use electrochemical cell data to evaluate the use of cells.	Students understand that a rate of reaction can be calculated in practice by measuring the amount of substance produced (or lost) in a reaction in relation to the time taken in order to calculate rates of reactions in g/s and cm3/s. Students know how to draw tangents to rate graphs in order to qualitatively and quantitatively describe the rate of reaction. Students understand collision theory in order to explain how the rate of reaction changes when the temperature, concentration, pressure, surface area is increased or a catalyst added. Students understand that reactions are reversible in order to give a description of the energy change of the backward reaction when given the forward (or vice versa) and to predict the products of reversible reactions. Students understand how variables such as pressure, temperature, concentration and catalysts influence the yield of reactants and products when given specific conditions in order to predict and explain optimum conditions for reactions such as the Haber Process.	Students understand how crude oil is formed and that that it is found in rocks and that it is a mixture of hydrocarbons Students understand how to use the general formulae for alkanes and alkenes in order to predict and explain the formulae of hydrocarbons. Students understand that hydrocarbons have different properties based on chain length in order to compare and contrast different organic molecules and to explain the process of fractional distillation. Students understand that long chain molecules can be cracked into smaller molecules and write equations in order to represent these reactions. Pupils understand that cracking is used to create smaller molecules and alkenes in order to explain that the rationale for cracking molecules is to meet the demand for shorter chain hydrocarbons (to use them for example, as fuels) Students have a knowledge of the structure and bonding of alkenes so that they are able to represent te first four alkenes, describe addition reactions and draw fully displayed formulae of the products. Students have a knowledge of alcohols, alkenes carboxylic acids so that they are able to draw and recognise the first four in each homologous series and give details for specific reactions of alcohols. Students have an understanding of addition, condensation and natural polymers and how they are produced so that they are able to draw diagrams to show the production of polymers from monomers.

		Pupils understand the differences between strong and weak acids in order to explain the pH differences between named and unfamiliar substances. Pupils know how electrolysis can be used to separate dissolved and molten substances in order to explain how elements more reactive than carbon are extracted, to predict the products of the electrolysis of molten and aqueous substances and to write half equations for electrolysis events.			Students have an understanding of amino acids and how they react through condensation polymerisation so that they are able to show repeating units and explain that they can be combined to form proteins.
What prior knowledge should pupils already know?	The structure of the atom including: the mass of protons, neutrons and electrons (Y8, Y9 Matter) The conservation of mass changes of state and chemical reactions (Chemistry Y9 Chemical Reactions) Changing the subject of a mathematical equation	Understanding how chemical reactions involve a rearrangement of atoms and how to represent this in an equation (Chemistry Y8 Chemical Reactions) A knowledge of specific types of reaction and how to represent them including combustion, thermal decomposition, oxidation and displacement reactions (Chemistry Y8, Chemical Reactions) Acids and alkalis, using the pH scale and how to represent a neutralisation reaction (Chemistry Y8, Chemical Reactions) Reactions of acids with metals including the reactions of catalysts	Energy changes relating to changes in state and how to describe these (Chemistry Y8 Chemical Reactions) Exothermic and endothermic chemical reactions and how to identify these (Chemistry Y8 Chemical Reactions)	Representing chemical reactions using formulae and using equations (Y8 Chemical Reactions) Exothermic and Endothermic reactions (Y10)	Covalent bonding (Chemistry, Y9 Matter) Writing chemical equations (Chemistry, Y10, Chemical Change)
What skills will pupils learn and apply? (disciplinary knowledge)	The ability to manipulate an equation to find one unknown is fundamental and transferrable to all areas of science. Calculating concentrations of solutions will enable pupils to carry out calculations involving titrations to determine the concentration of an unknown solution in further units.	The ability to use equations to show chemical change to support pupils in representing more complex chemical reactions when considering energy changes and rates. How to predict the formation of products in a chemical reaction to support	The ability to recognise and understand the energy changes that occur in exothermic and endothermic reactions is essential for being able to explain the changes in yield in a chemical reaction that is reversible The mathematical skills involved in determining energy changes help support and prepare pupils for further, more complex mathematical work in the next Unit.	The ability to manipulate an equation to find one unknown is fundamental and transferrable to all areas of science.	The knowledge of the names and formulae of hydrocarbons can be transferred to any area of chemistry where pupils are asked to write equations or complete calculations The skill of comparing organic molecules supports pupils in future units where they are asked to compare and contrast different types of resources.
Key vocabulary students will know and learn	Relative molecular mass Relative formula mass Moles Atom Economy	Reduction Oxidation Electrolysis Neutralisation Reactivity Series	Exothermic Endothermic Reaction Profile Activation Energy	Catalyst Collision Theory Equilibrium Chemical System	Fractional Distillation Cracking Intermolecular forces Viscosity Volatility Polymer
How will pupil understanding be checked &/or assessed?	Each school in the Trust follows the same assessment cycle process. All students will complete an informal key piece assessment every half term (at least) which take a variety of formats to assess golden knowledge learnt over the previous lessons. The key piece assessments are either retrieval-based questions to help students retrieve their prior golden knowledge, scientific literacy questions where students have to practice applying their golden knowledge to exam style questions in different contexts or exam style questions using a variety of command words such as describe, explain and evaluate. Students will then complete a short improvement activity based on gaps identified in the informal key piece and teachers will check these to ensure gaps have closed. In addition to these informal key piece assessments, all students complete a formal assessment at least every term which synoptically assess their retention and application of key golden knowledge learnt in Biology, Chemistry and Physics. Teachers will then use the Science Trust QLA tracker to identify gaps in knowledge; reteach accordingly and then students will complete a range of improvement style activities to close those gaps which are then checked by the teacher either through live marking or collection of books. Further details of the Science SHARE Assessment and Feedback policy can be found here: Q of E				
Resources available	Each school has their own shared area for each year group in each key stage. Lessons are planned to follow the SHARE Science lesson structure guidance document which can be found here: SCIENCE SHARE MAT lesson structure guidance.docx In summary: 1. First 5/Do Now to retrieve prior learning needed for the foundations of new learning. 2. I do/explicit instruction/guided explanation/teacher input through expert curriculum delivery. 3. We do/modelling where appropriate to show students how to remember and apply the key golden knowledge to different contexts. 4. You do/Independent practice to retrieve and practice applying the key golden knowledge to a variety of contexts. 5. Final 5 to retrieve key golden knowledge learnt in the lesson.				

	All schools have these SHARE Science curriculum plans, delivery plans which sit underneath these to guide staff on when to deliver each section of the curriculum and then schemes of learning and lesson resource folders to adapt in order to meet the unique needs of the students and classes they teach. All shared resources which are common across all schools can be found in the SHARE Science folder here: Home (click on the documents tab at the top of the page) All QA including lesson visits, work scrutiny and student voice will prioritise the SHARE Science Q of E Non-Negotiables Checklist which can be found here: SCIENCE SHARE MAT Non negotiables Q of E QA check list.docx All lesson resources are focussed on retrieval (through the Retrieve to Remember strategy) and practice, and this is built into these curriculum plan through effective sequencing of golden knowledge components. There are also KS3 and KS4 Golden Knowledge booklets for staff which outline the key golden knowledge linked to the exam specifications and National Curriculum at KS3 and KS4. These can be found here: Golden Knowledge If staff can't get access to any of the folders above, please request access through joanna.richards@sharemat.co.uk				
Notes Why this topic is important Why this topic is important…	This unit is important and central to chemistry at KS4 as it gives pupils an understanding of how mass and the concept of "amount of substance" can be used to quantify changes in chemical reactions. Students study this learning component now so that they are able to use the knowledge of "mass" to support their understanding of chemical change. Pupils will need know how to calculate a relative formula mass or a reacting mass across future areas such as "chemical change", "energy changes" and "rates of reaction". This topic gives pupils the skills that they need to quantify amounts of substance which can be applied to any chemical change involving a mass. This topic gives pupils the skills that they need to use and manipulate chemical equations to find unknown variables which will be explored in all areas of the KS4 science curriculum.	This topic provides pupils with an understanding of how to predict the products of a chemical reaction following change. This is central to understanding difficult chemical concepts and it is important that pupils learn this now so that they can fully understand how chemical change can lead to energy changes in the next unit. Studying this topic now enables pupils to understand chemical equations deeply and will enable pupils to make predictions about products of reaction in further units.	This topic enables pupils to bring together their understanding of chemical change and chemical equations with Studying this component now is important as an understanding of exothermic and endothermic reactions enables pupils to learn about how temperature changes influence the yield of product in a reversible reaction which pupils will learn about in the next unit.	This topic provides pupils with an understanding of how changing variables can alter a chemical reaction. This topic enables pupils to bring together their understanding of the particle model with chemical change. Covering this topic now is important as it gives pupils the opportunity to revisit their knowledge of different chemical reactions in the context of collision theory.	This topic is important because carbon chemistry forms a separate branch of chemistry and is a fundamental component of the subject its own right. Learning about organic chemistry now is important as it brings together pupils' knowledge of bonding, chemical reactions and enables them to understand key terminology used to describe the properties of resources before they learn about chemical resources later in the key stage. Learning about organic chemistry and hydrocarbons is important because pupils who go on to study chemistry in KS5 will be required to understand the importance of the C-C bond and the C=C bond and functional groups.