Subject: Science - Chemistry Year 9 Ability ALL

Topic:	Atomic Structure and the Periodic Table	Chemical Reactions and states of matter
Topic overview Students will learn…	The development and organisation of the periodic table. How the structure of the atom determines the position of its element on the periodic table.	The three types of bonding and their structures. Link the structures of simple and giant structures to their properties and characteristics.
What Golden Knowledge will pupils learn and remember?	Students will need to know how substances are chemically combined and how compounds are different to mixtures so they can determine how different mixtures are separated. Students understand how the structure of the atom was developed through experimental work so they can identify the process off how new experimental work can lead to the development of new ideas in science over time. Students understand how the size and structure of the atom determines its position on the periodic table so they can use the periodic table to identify likely physical and chemical properties of elements. Students understand how to use the information on elements on the periodic table to draw the electronic structure of the atom. Students know that the development of the periodic table led to elements being ordered into groups, periods, metals and non-metals. This development of the periodic table all students to understand that theories can be developed and disproved over time. This knowledge will enable them to determine the properties of an element depending on its position in the periodic table. Students will learn the reactions of the alkali metals so these can be contrasted with other metals and start to understand how reactivity changes as a group of metals is descended. Students will learn the reactions of the halogens so these can be used to explain how the reactivity of non-metals changes as a group is descended. Students will learn about the noble gases so that knowledge of electronic structure can be developed, leading to the formation of more stable ions with noble gas electronic structures. Students learn how physical properties change down a group of simple monoatomic elements so they can start to understand how small molecules are bonded. Students will learn the properties of transition metals, this will enable them to contrast these properties to those of the alkali metals. This will help students match the structure to the function of different metals, such as using transition metals as catalysts.	Students will need to know how electrons are rearranged during bonding which will enable them to be able to identify the features of the compound produced for example ions will be formed when electrons are transferred, delocalised or shared. Students will be able to use this to deduce the molecular formula of a substance from a given model or diagram. Students will learn how non-metals bond as simple and giant structures, this will enable them to match materials to suitable functions. Students will learn how non metals and metals react, giving rise to chemicals with completely new properties, this will enable to better understand how electronic structure gives rise to reactivity, building on and reinforcing knowledge in unit 1 chemistry. Students will learn how the physical properties of ionic compounds change when solid, molten or dissolved. Using this to explain how electricity can be conducted. Students will learn how metals react by delocalising electrons and forming positive ions. This will enable them to better understand the forces that bond atoms together as well as what will happen when metals of different types are allowed together to change the properties. Students will be able to construct dot and cross diagrams to show transfer or sharing of electrons are ionic or covalent bonds respectively. Student will learn how solids, liquids and gases are arranged, but now will be able to describe the limitations of these models as the interaction between atoms/ions or molecules has previously been missing. (HT) Students will learn about polymers as a means of better understanding how size of molecule can relate to their state, this will enable them to better understand how small, large and giant covalent structures fit relatively with each other in a spectrum. Students will learn how metals form metallic bonds so that they can use this to explain why metals are able to conduct electricity in a solid state and why certain allotropes of carbon can conduct electricity too. Students will be introduced to the idea of bulk and nanoparticles in science. Students will then be able to better evaluate the use of different materials in different circumstances.

What prior knowledge should pupils already know?	Students should already have a good idea of how the periodic table is constructed in terms of reactivity and the position of metals and nonmetals. (Year 8 Matter) Students will have learnt signs of a chemical reaction and ways of measuring relative reactivity of chemicals (year 7 Reactions) (year 8 Reactions) Students will have an understanding of the particle model of matter and changes of state. (Year 7 matter) Students will have already learnt that matter can be elemental, as compounds or as mixtures (Year 8 Matter)	Students will already be able to recall whether an element is a metal or non-metal based on it's position in the periodic table (Year 8 Matter) Students will have already studied how solids, liquids and gases are arranged and be able to recall the changes of state, this will enable them to describe physical properties of ionic, covalent and metallic bonding. (Year 7 Matter) Students will have studied the alkali metals and halogens, so will know the chemical and physical properties of how these elements will differ to the ionic compounds they form. (Year 9 Unit 1 chemistry).
What skills will pupils learn and apply? (disciplinary knowledge)	This topic will provide students with an understanding of atomic structure and the periodic table. This will prepare them for learning how bonding and structure are related to the properties of substances, for example carbon forms 3 bonds in graphite and the last electron becomes delocalised. This topic develops an understanding that scientific theories are continually reviewed and if disproved another theory is put forward. This should allow students to think critically for themselves and not always believe what they may see in the media. This links to Biology, Chemistry and Physics and all scientific theory through KS4, KS5 and for their scientific literacy for the rest of their lives. The knowledge on the movement of substances will be used and built upon through further study in a range of Biology, Chemistry and Physics topics in the future. The concept of the small scale is introduced here which will be added to when looking at atoms and space. Practical skills including: • using a range of equipment safely • Taking accurate measurements • Solving problems Mathematical skills including • Prefixes e.g. micro • Recording and presenting data • Surface area: volume ratio Start to develop the skill of constructing equations at the basic How to balance equations. Practical skills are also a key element of this topic and prepare students for future components. Separation / purification techniques such as filtration and distillation are replicated at a higher level at KS5 during Topic 3 Organic Chemistry therefore it is vital students become confident in developing these skills early on. Students should be proficient at using a scientific calculator to calculate the relative atomic mass of an element given the percentage abundance of its isotopes. Manipulating and understanding how to input data into an equation is a replicated skill throughout their five-year learning journey	This topic will provide students with improved data analysis skills as they will be comparing properties of materials and linking this to the type of bonding. Pupils will be able to explain the symbols used in chemical equations to aid understanding. Pupils can link to future topics such as fractional distillation, hydrocarbons, ionic compounds in electrolysis (supporting the understanding of ion structure and movements of electrons. To enable pupils to write half equations). Students should be proficient at using a scientific calculator to calculate the relative atomic mass of an element given the percentage abundance of its isotopes. Manipulating and understanding how to input data into an equation is a replicated skill throughout their five-year learning journey Students should be proficient at using a scientific calculator to calculate the relative atomic mass of an element given the percentage abundance of its isotopes. Manipulating and understanding how to input data into an equation is a replicated skill throughout their five-year learning journey

Key vocabulary pupil will know and learn	Electron Proton Neutron Energy level Isotopes Relative atomic mass	Ions Electrostatic Covalent bond Metallic bond Ionic bond Intermolecular forces
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	An understanding of atomic structure and the periodic table underpins everything throughout the students five-year learning journey. E.g. students must first know the definition of an element before examples and their structure. They will then use this to identify its position on the periodic table and explain its properties. Later students will require this knowledge to look further into their bonding and structure, their reaction in Year 10 and even their uses in Year 11. Furthermore, Topic 1 at KS5 uses this knowledge as a base for electron configuration and identifying isotope abundance through mass spectrometry.	An understanding of atomic structure and the periodic table underpins everything throughout the students five-year learning journey. E.g. students must first know the definition of an element before examples and their structure. They will then use this to identify its position on the periodic table and explain its properties. Later students will require this knowledge to look further into their bonding and structure, their reaction in Year 10 and even their uses in Year 11. Furthermore, Topic 1 at KS5 uses this knowledge as a base for electron configuration and identifying isotope abundance through mass spectrometry.