Subject: Science - Chemistry Year 8 Ability ALL

| Topic : | Periodic table | Elements | Chemical Energy | Types of reaction | Climate | Earth's Resources |
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| Topic overview<br><br>Students will learn… | how elements are arranged on the periodic table based on their properties. | that elements and their compounds have differing properties. | to use experimental observations to distinguish exothermic and endothermic reactions and to use a diagram of relative energy levels of particles to explain energy changes observed during a change of state. | that mass is conserved over a range of different reactions. | how Carbon is recycled through the environment | about where raw materials come from in the earth, how these are extracted and recycled. |
| What Golden Knowledge will pupils learn and remember? | Students will learn how elements are arranged in the periodic table. Experiments are performed to investigate the properties of elements and to *begin* to relate this to their atomic structure. The focus is on Groups 1, 7 and 0.<br><br>Students will be able to describe the differences between metals and non metals including pH of oxides<br><br>Students will be able to categorise elements as metals and non metals based on their properties.<br><br>Students will be able to describe that reactivity changes within groups so they can make predictions on an elements reactivity.<br><br>Students will be able to Describe patterns in chemical and physical properties of the group 1 (alkali) metals so predictions about | Students will learn that the huge range of materials is made from a relatively small number of elements. They will explore the characteristics of some elements<br><br>Students will be able to describe the differences between elements, compounds and mixtures so that properties of materials can be better understood and ways of separation can be predicted.<br><br>Students will be able to describe whether chemical reactions have happened or not based signs of a chemical reaction, identifying differences between reactants and products. | <u>Endothermic and Exothermic reactions</u><br>(1)Students describe an endothermic change and an exothermic change, giving examples of each.<br><br>(2) Students Investigate exothermic reactions<br>(3) Students investigate endothermic reactions<br><br><u>Energy Level diagrams</u> Students consider energy level diagrams for exothermic and endothermic processes (freezing and melting) and reactions. Students might construct their own energy level diagrams.<br><br><u>Bond Energies</u><br>Students recall what happens to chemical bonds during exothermic and endothermic reactions.<br>Students calculate bond energies in a reaction and use these to explain energy changes in reactions. | <u>Chemical Reactions</u><br>Students define and describe chemical reactions and catalysts, recalling ways to tell a chemical reaction is happening. They will<br><br>explain the difference between chemical reactions and physical processes.<br><br><u>Combustion</u><br>Students describe combustion and the reactants and products in the reaction, using particle diagrams to describe what happens in combustion reactions. Students consider future fuels.<br><br><u>Energy in fuels practical</u><br><br><u>Thermal decomposition</u><br>Students recall what happens in a decomposition reaction, describing thermal decomposition using equations. They will explain how to test for the presence of carbon dioxide gas and how it can be used to measure rate of reaction.<br><br><u>Metal Carbonate thermal decomposition practical</u><br><br><u>Conservation of Mass</u> | Students will be able to use diagrams to show how carbon is recycled in the environment and through living things.<br><br>Students will be able to recall what climate change is and its effect on the Earth's temperature.<br><br>Students will be able to describe the impacts of human activity. They will also be able to understand how processes rely on each other; for instance, photosynthesis and respiration.<br><br>Students will be aware of methane and carbon dioxide as greenhouse gases. This will help them understand the impact of greenhouse gases and where they come from.<br><br>Students will be able to apply knowledge of greenhouse gases to the greenhouse effect and its impact on climate and local weather patterns.<br><br>Students will also be able to identify the composition of the Earth's atmosphere.<br><br>Students will know the percentage composition for gases in air. | Students will be able to explain why recycling some materials is particularly important. This will link to the importance of using resources in a sustainable manner in order to make the Earth's resources last longer.<br><br>Students will be able to describe how the Earth's resources are turned into useful materials or recycled. This will demonstrate the versatility of certain resources.<br><br>Students will be able to link recycling to current schemes and campaigns in the media and politics.<br><br>Students will be able to describe how metals are often found in ores and how they can be extracted.<br><br>Students will be able to justify the method used to extract metals by looking at data about their reactivity. This will develop analysis skills and knowledge of the reactivity series for the students.<br><br>Students will be able to suggest the factors they would take into consideration when deciding whether extracting a metal is practical. This develop student's evaluation skills and linking both social and economic factors to their learning. |

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| | properties and reactions can be made.<br><br>Students will be able to describe patterns in chemical and physical properties of the group 7 halogens so these can be contrasted with group 1.<br><br>Students will be able to describe the patterns in chemical and physical properties of the group 0 (noble) gases so these can be related to their position within the periodic table. | Students will learn to write word and symbol equations so that conservation of mass can be shown.<br><br>Qualitatively examine the nature of ceramics, polymers, and composites | | Students explain the conservation of mass and use the idea to balance symbol equations.<br><br><u>Conservation of mass practical (1)</u><br>Students use Magnesium and Oxygen to develop knowledge and understanding of conservation of mass and laboratory procedures.<br><br><u>Conservation of mass practical (2)</u><br>Students use marble chips and acid to develop knowledge and understanding of conservation of mass and laboratory procedures. | Students will be able to evaluate the implications of a proposal to reduce carbon emissions.<br><br>Students will be able to evaluate claims that human activity is causing global warming or climate change.<br><br>Students will be able to compare the relative effects of human-produced and natural global warming. | Students will be able to suggest ways in which changes in behaviour and the use of alternative materials may limit the consumption of natural resources.<br><br>Students will be able to suggest ways in which waste products from industrial processes could be reduced.<br><br>Students will be able to use data to evaluate proposals for recycling materials. |
| What prior knowledge should pupils already know? | This unit develops ideas from the KS1 and 2 programme of study where students compare and group materials together, according to whether they are solids, liquids or gases at room temperature. It also relates to work covered to describe the simple physical properties of a variety of everyday materials, and compare and group together a variety of everyday materials on the basis of their simple physical properties. | This unit develops ideas from the KS1 and 2 programme of study where students identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses<br>This unit relates closely to unit 7 ‘Particle model of solids, liquids and gases’ and unit 7 ‘Solutions’, in which the particle model is introduced then developed.<br>Students may<br>• know that there are approximately 100 elements which are the building blocks for all materials | This unit builds on unit ‘Metals and non-metals’ (8HT2) and unit ‘Types of reaction’ (9HT3a). It relates to other units, particularly to aspects of photosynthesis and respiration, and to units about energy such as topics ‘Heating and cooling’ and ‘Energy and electricity’. It is helpful if students know that ‘burning’ involves a reaction with oxygen in which oxides are formed, that new materials are formed when chemical reactions occur (and can identify evidence of these). It is also helpful if students have used symbols and formulae and word and/or symbol equations and are able to recognise an order of reactivity of metals. | This unit uses ideas developed in the key stage 2 programme of study. It builds on ideas introduced in unit 5C ‘Gases around us’ and unit 6D ‘Reversible and irreversible changes’ in the key stage 2 scheme of work. This unit relates closely to unit ‘Chemical Energy‘ and includes work on the conservation of mass in chemical reactions, including burning. It is helpful if pupils know that there are many gases and have explored changes in which new materials are formed and which cannot easily be reversed. | Students should already know plants are able to make their own food. This will be linked to photosynthesis.<br><br>Students have the scientific understanding of how cycles work, they will have covered the water cycle. This level of thinking can be applied to the Carbon cycle. | Students should already know to compare and group materials based on their properties. This will help link the learning on the reactivity series and uses of metals from ores.<br><br>Students will also know what a quarry is, they will be able to build on this to understand what they are used for and how they can be used to extract some of the Earth’s resources.<br><br>Students will have worked scientifically to identify evidence and use it to support theories. They will be able to use this skill to help develop discussions looking at arguments for and against extracting a metal. |

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| | | • know that elements are composed of tiny particles called atoms<br>• know that compounds are formed when atoms of different elements join<br>• have explored a number of chemical reactions<br>• have made and separated mixtures | | | | |
| What skills will pupils learn and apply?<br><br>(disciplinary knowledge) | Present qualitative data in a way which enables patterns to be described.<br><br>Investigate the relative reactivity of different metals, identifying and controlling relevant variables | Model differences between particles in elements and non-elements<br><br>Organise and sequence information from secondary sources.<br><br>Choose an approach to find out whether a substance is an element or not. | Making observations.<br><br>Measurement of temperature.<br><br>Consideration of control variables.<br><br>Use experimental observations to distinguish exothermic and endothermic reactions.<br><br>Use a diagram of relative energy levels of particles to explain energy changes observed during a change of state. | Explain observations about mass in a chemical or physical change.<br><br>Use particle diagrams to show what happens in a reaction.<br><br>Compare the pros and cons of fuels in terms of their products of combustion.<br><br>Use known masses of reactants or products to calculate unknown masses of the remaining reactant or product.<br><br>Devise a general rule for how a set of compounds reacts with oxygen or thermally decomposes.<br><br>Balance a symbol equation.<br><br>Use mass of reactant in equation to determine mass of product e.g. magnesium and oxygen. | Students will be able to apply their knowledge on the composition of the Earths atmosphere to 5.9.1 where they study the composition of the atmosphere in more detail. They will also be able to form comparisons with this to the Earths early atmosphere.<br><br>Students will be able use their knowledge on what photosynthesis and expand on it with the equation.<br><br>Students will be able to use their understanding of methane gases to how they are produces. They will also describe greenhouse effect in terms of the interaction of short and long wavelength radiation with matter.<br><br>Students will be able to link 2 human activities which contribute to the increase in greenhouse gases (Carbon Dioxide and Methane).<br><br>Students will be able to look at data and evidence to suggest why scientists may believe why human activities will contribute to an increase in the Earths temperature. | Students will be able to link the knowledge to identify how the carbon footprint can be reduced by reducing carbon dioxide and methane emissions. They also be able to identify limitations with these actions.<br><br>Students will be able to use their understanding of the Earth's Resources to their uses such as warmth, shelter, food and transport. Natural resources which are supplemented by agriculture, provide food, timber, clothing and fuels.<br><br>They will be able to distinguish between finite and renewable resources.<br><br>Students will be able to link the extraction of metals and the reactivity series to understand how electrolysis is used to extract metals.<br>• |

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| | | | | | Students will be able to built on the knowledge learnt in this unit to further explain the impacts of global warming, linking the scale, risk and environmental implications of it. | |
| Key vocabulary pupil will know and learn | Periodic table<br>Physical properties<br>Chemical properties<br>Groups<br>Periods | Elements<br>Atom<br>Molecules:<br>Compound<br>Chemical formula<br>Polymer: | Catalysts<br>Exothermic reaction<br>Endothermic reaction<br>Chemical bond | Fuel<br>Chemical reaction<br>Physical change<br>Reactants<br>Products<br>Conserved | Global warming<br>Fossil fuels<br>Carbon sink<br>Greenhouse effect | Natural resources<br>Mineral<br>Ore<br>Extraction<br>Recycling<br>Electrolysis |
| 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<br>In summary:<br>1. First 5/Do Now to retrieve prior learning needed for the foundations of new learning.<br>2. I do/explicit instruction/guided explanation/teacher input through expert curriculum delivery.<br>3. We do/modelling where appropriate to show students how to remember and apply the key golden knowledge to different contexts.<br>4. You do/Independent practice to retrieve and practice applying the key golden knowledge to a variety of contexts.<br>5. Final 5 to retrieve key golden knowledge learnt in the lesson.<br><br>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)<br><br>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<br><br>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.<br><br>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<br><br>If staff can't get access to any of the folders above, please request access through joanna.richards@sharemat.co.uk | | | | | |
| Notes<br><br>Why this topic is important | This topic seeks to describe some of the patterns in the periodic table which | The unit provides a foundation for unit 7 'Separating mixtures', and unit | This unit is fundamental to an understanding of how chemical reactions can be used as a source of energy and how the forces between particles can act as an energy store. | This unit acts as a focus for prior learning on the particle model, atoms, elements and compounds, and the periodic | Students will be able to explain the role of carbon in the survival of all living things. They | Students will be able to use their learning in this topic to understand why the extraction of metals takes place. They will also be able to |

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| | enabled its' development. This is, however, prior to an understanding of structure and bonding. Students will need a strong understanding of outer shell completion and fluency in the charges of subatomic particles and their electrostatic behaviour (not obtained until year 9 HT4) to explain these patterns. Teachers are therefore advised against fragmenting this topic and guided to focus upon the simple nature of the octave pattern at this point in the student's learning journey. | 8 'Reactions of metals and metal compounds' and unit 9 'Types of reaction'. | It forms the basis for an understanding of fuels and is helpful in terms of higher understanding of the energy relationship between respiration and photosynthesis. | table. It enables students to complete the learning journey from particles to balanced equations. It completes the circle by returning from the abstract particle model to the concrete experienced evidence of conservation of mass. | will be able to visualise how carbon is recycled naturally. Students will be able to see a visual link with both Biological and Chemical process working together in the Carbon Cycle e.g. burning and photosynthesis.<br><br>By understanding where Carbon is produced and utilise. Students will be able to suggests ways in which we can help reduce the level of carbon dioxide in the atmosphere as a greenhouse gas.<br><br>Students will be able to take away knowledge and information which helps them understand why schemes to encourage recycling and decreasing carbon footprint exist. They will be able to play an active role in society and contributing to a sustainable planet. | evaluate the arguments for and against extracting a metal, using both social and economic reasoning.<br><br>Students will be able to form links to everyday politics and schemes by understanding the benefits of recycling and how it can be used to make useful products. |