Ian Ramsey CE Academy: CHEMISTRY Curriculum Progression Model

CURRICULUM OVERVIEW

Curriculum What we study. Why study it. Why study it now.

What we need pupils to have learnt at each point/end of each year and the logical connection and the sequential learning between what is studied in the different terms and between years. This is what is to be covered and when, effectively creating the idea that the intent is the curriculum. The intent is everything up to the point of teaching. The purpose of our curriculum and the knowledge we want our pupils to go away with in their working memory.

Science at Ian Ramsey Church of England Academy aims to spark interest and enjoyment of the natural phenomena around us. Our curriculum develops pupils' understanding and knowledge of key concepts that underpin everyday life, whilst promoting investigative skills that question and help pupils understand how the world works.

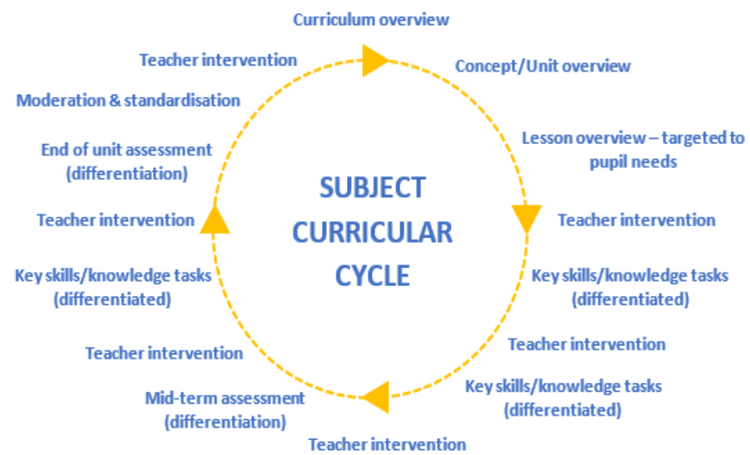
How we teach the curriculum

How we make learning memorable and how we support our pupils to remember it. How we use rote, retrieval, interleaving, metacognition etc. in our teaching; why we teach in the way we are and justify decisions around how and why it is being taught this way.

What we expect from the curriculum

How we make it challenging and ambitious for our pupils. How we assess learning, knowledge and understanding; what have they learnt and how well have they learnt it? Consider what assessments we use, when we use them and how and why we assess this way?

	Setting	Designing	Planning	Delivering
YEAR 7	**What:** Particle Model - pure and impure substances	**What:** Chemical and Physical Reactions	**What:** Structure of the Earth - Rocks	The science curriculum at Ian Ramsey looks at the big ideas within science and re-visits each of these underpinning key concepts each year. This allows for a spiralling curriculum which allows for retrieval and practice before deepening the knowledge and understanding of each key concept. During Years 7-9 science is taught as a combination of biology, chemistry, and physics. At GCSE, these specialisms as individual disciplines, however the key concepts continue to underpin the curriculum across the five years. **Chemistry:** • Minerals and properties • Chemical changes • Earth and atmosphere	Assessment for Learning is used in all lessons to provide evidence for use by pupils and teachers to decide where pupils are in their learning, where they need to go and how best to get there. **Formative Assessment** This is used to provide information about what pupils know, understand and can do. This is used by both the teacher and the pupil to determine where pupils are in their learning and how to continue to develop their knowledge and skills within the subject. This will include: • Questioning • Effective teacher feedback (written and verbal) • Peer feedback • Pupil self-assessment **Summative Assessment** This is also used at key points in each year to evaluation pupils' achievement. These allow a holistic view of pupils' performance and support the identification of areas requiring additional focus to improve learning overall.
	What: This topic builds on and consolidates KS2 knowledge and understanding about solids, liquids, and gases. It places the knowledge that all materials are made from atoms and can be classified as solids, liquids, or gases. Pupils will explore the difference between pure substances made up on one chemical element and impure make of two or more elements or compounds.	**What:** This topic builds on and consolidates KS2 knowledge and understanding about physical changes, changes of state and reversible reactions. It introduces chemical changes and signs of a chemical reaction, the need for particles to collide with each other and where this does and does not lead to a chemical reaction. This unit introduces key investigative skills and builds on observational skills developed at KS2.	**What:** This topic builds on and consolidates KS2 knowledge and understanding of rocks and fossils. Pupils consider the different types of rock and they ways they are formed. This topic complements Geography's Dynamic Earth unit and reinforces learning around the rock cycle and the impact of weathering and erosion as part of the rock cycle.	
	Why now: At KS2, pupils will have compared and grouped together everyday materials, looking at properties. This is the introduction of the particle model, which goes beyond materials on a macro level and concrete thinking to focus on the micro level of particle models.	**Why now:** At KS2, pupils will have undertaken investigative activities looking at physical changes and reversible reactions. This unit builds on this but also follows on from the particle model unit studied in the previous term.	**Why now:** Pupils will have explored different rocks and soils within their local area at KS2. Geography teaches Dynamic Earth during the same term; this allows pupils to make cross-curricular links and deepen their knowledge and understanding of the topic.	
YEAR 8	**What:** Mixtures and Separation	**What:** Acids and Alkalis	**What:** Atmosphere and Climate Change	
	What: Year 7 work on the particle model developed with the idea of atoms, elements, and compounds. Here pupils are introduced to further separation techniques to those studied previously in KS2 and Year 7 with the introduction of crystallisation and chromatography being studied. The ideas about solubility and crystallisation are essential to salt preparation techniques later in the curriculum.	**What:** The subject of acids, alkalis, and salt preparation are introduced here and gradually built up. Pupils develop knowledge and understanding of acids, bases, and alkalis and how they are categorised n the pH scale and their reactions together. It is reviewed more formally and with greater depth in the subsequent years.	**What:** The previous unit looks at the idea of acidic substances and chemical reactions. This unit offers a chance to review these ideas in the context of the Earth's atmosphere. Pupils will develop their understanding of the impact of climate change and the human impact on it. The gases in the atmosphere and link to climate change which is developed further in a Year 9.	
	Why now: At KS2 pupils will have studied solutions, and have used their knowledge of solids, liquids, and gases to decide how might mixtures be separated. This unit develops and deepens pupils' understanding of the particle model studied in Year 7.	**Why now:** Acids are not covered in KS2, however before investigating different types of reactions, it is important to understand different types of chemical substances and reagents. Pupils require this knowledge to enable them to further understanding elements and how chemicals react.	**Why now:** The atmosphere is not covered in KS2; however, pupils have previously looked at the structure of the Earth in Year 7. This unit helps consolidate theory developed and explored across the year considering the chemical reactions and subsequent impact on the Earth's atmosphere.	
YEAR 9	**What:** Atomic Structure and the Periodic Table	**What:** Types of Chemical Reaction	**What:** Obtaining and using metal – ceramics, polymers, and composites	
	What: The electronic configuration of an atom is fundamental to an understanding of bonding, which is taught in Year 10. This model is also used to explain reactivity which is looked at across Years 10 and 11. This unit discusses the historical development of the periodic table and the way that elements are placed in periods or grouped.	**What:** This topic extends the idea of chemical change to several further examples, allowing the introduction of word equations and how interpret and solve these equations. Chemical changes and equations will be the foundation of all the other units within the big idea of *Chemical changes*.	**What:** The source of the metal elements is considered, and this leads to the use of metals in everyday life. Alloys are introduced and the reactions of metals with oxygen and with acids leads on from the previous unit. This topic focusses on the reactivity series and this is applied to displacement reactions, metal extraction methods and corrosion.	
	Why now: The idea of atoms was introduced in Year 8, and the idea of elements was also introduced along with their classification. Atomic theory is fundamental to pupils acquiring a deeper knowledge and understanding of chemical reaction and interactions of substances, which will be studied throughout the coming years.	**Why now:** Pupils have studied features of a chemical reaction and explored different types of chemical substances. This unit provides the opportunity to develop knowledge and understanding of different types of chemical reactions, providing key foundations to the chemical processes in following units.	**Why now:** This topic leads into bonding where the reason for the properties in terms of the structure of some of these materials will be considered.	



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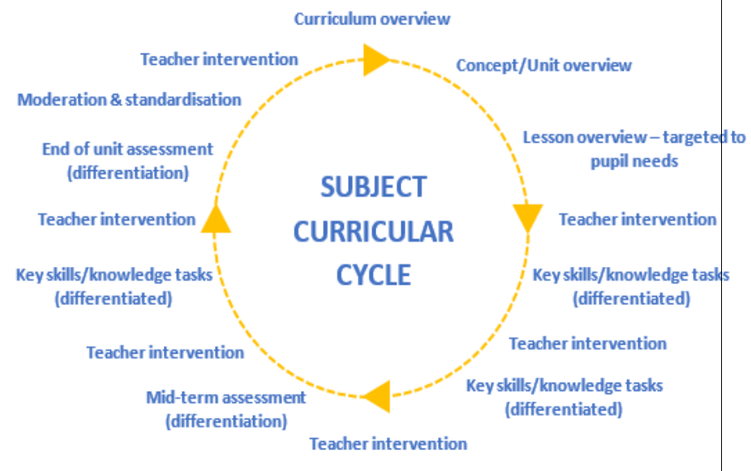
Year 10 and Year 11

Setting	Designing	Planning			Planning	Delivering
What: Bonding	**What: Groups in the Periodic Table**	**What: Rates of Reaction**	**What: Energy Change**	**What: Fuels**	**What: Calculations Involving Mass**	The science curriculum at Ian Ramsey looks at the big ideas within science and re-visits each of these underpinning key concepts each year. This allows for a spiralling curriculum which allows for retrieval and practice before deepening the knowledge and understanding of each key concept. During Years 7-9 science is taught as a combination of biology, chemistry, and physics. At GCSE, these specialisms as individual disciplines, however the key concepts continue to underpin the curriculum across the five years. **Chemistry:** • Minerals and properties • Chemical changes • Earth and atmosphere	Assessment for Learning is used in all lessons to provide evidence for use by pupils and teachers to decide where pupils are in their learning, where they need to go and how best to get there. **Formative Assessment** This is used to provide information about what pupils know, understand, and can do. This is used by both the teacher and the pupil to determine where pupils are in their learning and how to continue to develop their knowledge and skills within the subject. This will include: • Questioning • Effective teacher feedback (written and verbal) • Peer feedback • Pupil self-assessment **Summative Assessment** This is also used at key points in each year to evaluation pupils' achievement. They allow a holistic view of pupils' progress and support the identification of areas requiring additional focus to improve learning overall.
What: This fundamental to the understanding of GCSE Chemistry. Pupils' prior learning about atoms is deepened by exploring the different types of bonds within substances and the properties of different types of bonding. This provides theory to explain further topics such as trends in the periodic table, energy changes, acids, and fuels.	**What:** Pupils consider links with bonding of the previous unit. Oxidation and reduction appear in this unit, which has been covered briefly in Year 9. This allows for revisiting of learning on bonding as well as displacement reactions. It also provides context for bonding and offers pupils the opportunity to apply understanding of the bonding models.	**What:** Pupils are introduced to collision theory; how the rate of reaction is determined by the frequency of collisions and energy of the reactant particles. It is relevant to any unit involving reactions but will be used in Year 11 when considering the conditions under which equilibrium processes are carried out in industry.	**What:** This unit establishes pupils' understanding of energy changes in the context of a model of a reaction where bonds are broken in the reactants and formed in the products. Pupils explore how energy changes are calculated, consolidating their understanding of the concept of activation energy is re-visited from the previous unit on rates of reaction.	**What:** This forms the foundation for organic chemistry, studying areas including crude oil and its separation into useful products – cracking where necessary. Products of combustion are considered, both complete and incomplete, and their problems discussed. Pupils deepens their knowledge and understanding of separating mixtures and combustion reactions.	**What:** This unit presents a quantitative approach to chemical masses, including: • calculating masses of products • empirical formulae • the concept of moles Pupils' knowledge and understanding is developed with further calculations including those for titration in Year 11.	
Why now: This unit has been placed at the start of Year 10, rather than the end of Year 9 to ensure pupils have matured in their higher order thinking skills. It builds on atomic theory in Year 9 but provides foundation to knowledge acquisition throughout Year 10 and 11.	**Why now:** In Year 9 the idea of the periodic table as a list of elements was introduced, and atomic structure was studied. This was then linked to the arrangement of the elements in the modern periodic table as well as the periodic table's historical development.	**Why now:** This unit relies on a good understanding of the particulate nature of matter and leads into the following unit with ideas about bond making and breaking. This allows pupils to recap particle theory and link to how chemical reactions take place.	**Why now:** Pupils have previously studied the concepts of exothermic and endothermic forms of chemical reaction. Pupils will reinforce ideas about how reactions occur prior to being taught equilibrium in Year 11.	**Why now:** In Year 8 pupils studied the atmosphere, looking at burning fossil fuels and how it effects the environment. Pupils recap combustion, initially taught in type of reactions but then provides context into fuels of the Earth	**Why now:** This build on work in Year 9 in the consideration of equations and the relative mass of atoms with the idea that mass is conserved being implicit. Pupils have the mathematical skills needed to problem solve within this unit; including low prior attainers as rearranging equations and standard form are covered in maths.	

What: Reactions of Acids	**What: Electrolytic Processes and Haber Process**	**What: Key Concept Review and CORE PRACTICAL and CONSOLIDATION**	**Separate Chemistry units to be within SOL:**	
What: Acids, alkalis, and neutralisation are explained in terms of ions, which are introduced for the first time. Ionic equations are introduced through the neutralisation equation. Reactions of acids with metals, oxides, hydroxides, and carbonates are revisited, leading on to salt preparation methods with quantitative methods developed by studying titrations.	**What:** Included in this topic is the heart, circulatory system, and cellular respiration. The content in this topic revolves around many previous ones, including cells, systems and chemical transportation and reactions. It allows prior learning to be drawn together consolidating pupils' understanding.	**What:** Pupils will re-visit the key concepts to aid retrieval for examinations. Pupils will also re-visit each core practical to re-enforce the practical skills to consolidate the key knowledge and understanding of each.	• Transition metals/Alloys/Corrosion • Titrations/Percentage yield/Atom Economy • Calculations with Gases • Fuel Cells • Testing ions/Flame tests • Alkanes/Alkenes/Alcohols/Carboxylic acids/Polymerisation/Combustion and production of Ethanol • Nanotechnology/materials and uses	
Why now: The acids topic has been introduced gradually throughout previous years and this is completed in Year 11 to re-visit practical skills in more detail, looking particularly at precision. It is taught after calculations in Year 10 so that pupils can re-visit concentration and mole calculations in practice.	**Why now:** Pupils can build on their understanding of ions, electrolysis - in the context of metals - and factors affecting the rate of reaction studied in Year 9 and 10. This provides pupils the opportunity to recap and deepens their understanding before applying this knowledge, referring to Le Chatelier's principle.	**Why now:** Pupils are provided the opportunity to review key ideas and provide starting point for examination revision and practise key practical skills prior to examination, providing opportunities to ensures all pupils have completed core practical activities or repeat core practicals where needed.		