

**EMMANUEL COLLEGE**  
**THE SCIENCE DEPARTMENT**

Year 9



<b>Year 9</b>	<b>Autumn, Half-Term 1</b>	<b>Autumn, Half-Term 2 and Spring, Half-Term 1</b>
<b>Unit Title</b>	Atomic Structure and the Periodic Table	Bonding
<b>Key Question(s)?</b>	How does the structure of an atom affect the chemical properties of an element?	How do atoms bond with other atoms and how does the atomic structure of a substance affect its properties?
<b>Threshold Concepts</b>	<p>The periodic table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties.</p> <p>The historical development of the periodic table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time as new evidence emerges.</p> <p>The arrangement of elements in the modern periodic table can be explained in terms of atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels.</p>	<p>Chemists use theories of structure and bonding to explain the physical and chemical properties of materials.</p> <p>Analysis of structures shows that atoms can be arranged in a variety of ways, some of which are molecular while others are giant structures.</p> <p>Theories of bonding explain how atoms are held together in these structures.</p> <p>Scientists use this knowledge of structure and bonding to engineer new materials with desirable properties.</p> <p>The properties of these materials may offer new applications in a range of different technologies.</p>
<b>Link to Prior Learning</b>	Students will have covered some elemental trends in the periodic table from the Year 7 topic, but this goes into much more detail in terms of atomic structure.	This builds directly on from for first Year 9 unit.
	<b>Spring, Half-Term 2 and Summer, Half-Term 1</b>	<b>Summer, Half-Term 2</b>
<b>Unit Title</b>	Rates of Reaction	Energy Changes
<b>Key Question(s)?</b>	What are the factors that affect the speed of a chemical reaction?	How does energy transfer during a chemical reaction?
<b>Threshold Concepts</b>	<p>The rate of a chemical reaction can be found by measuring the quantity of a reactant used or the quantity of product formed over time.</p> <p>Factors which affect the rates of chemical reactions include: the concentrations of reactants in solution, the pressure of reacting gases, the surface area of</p>	<p>Energy is conserved in chemical reactions. The amount of energy in the universe at the end of a chemical reaction is the same as before the reaction takes place.</p> <p>An exothermic reaction is one that transfers energy to the surroundings so that the temperature of the surroundings increases.</p>

	solid reactants, and the temperature and the presence of catalysts.	<p>An endothermic reaction is one that takes in energy from the surroundings so that the temperature of the surroundings decreases.</p> <p>Chemical reactions can occur only when reacting particles collide with each other and with sufficient energy. The minimum amount of energy that particles must have to react is called the activation energy.</p>
<b>Link to Prior Learning</b>	Students looked at the ways chemical reactions work in Year 8 but did not look at the factors affecting the speed of a chemical reaction.	Students have already looked at energy changes in Year 8, but this was only covered in a qualitative manner.
<b>Knowledge and Sequencing Rationale</b>	<p>We believe it is important to start the GCSE course with the key concepts that underpin the study of chemistry. The idea that the arrangement of elements in the modern periodic table can be explained in terms of atomic structure underpins the nature of matter, and this then leads on to the nature of bonding and the structure of different substances. Whilst these two units (C1 and C2) are conceptually challenging for Year 9 students, we know that the concepts covered underpin everything they will study in GCSE. We have developed the curriculum structure so that students keep coming back to these (see highlighted in green in Year 10 and Year 11) so that they reinforce their understanding of the underpinning concepts in Chemistry across their studies. Students then move on to the rates (C6) and energy (C5) units in Year 9 which look at some of the properties of chemical reactions. We have chosen these so that students will develop their mathematical and practical skills in the early parts of their GCSE studies. These units are not as conceptually challenging, but allow students to do lots of investigating, observing, experimenting or testing out ideas and thinking about them. This is why we have brought these topics forward to Year 9. In Year 9 Chemistry we do not particularly differentiate between combined science or triple award in terms of sequencing. This is to allow opportunities to see which students can cope with the rigours of the more difficult triple award units that are to follow in Year 10 and Year 11.</p>	