



## Chemistry Department – Curriculum Intent

Overview of KS4 Curriculum			
Subject: GCSE Chemistry (Triple Science)		Exam Board: AQA	Head of Department: Mr T Parker
	Year 9	Year 10	Year 11
Autumn Term	<p>All students begin learning GCSE Chemistry content in Year 9. Only topics common to both the Combined and Triple Science pathways are taught in Year 9. Students select which science pathway they wish to pursue for at GCSE in Year 10</p> <p><b>4.1 Atomic structure and the periodic table</b></p> <p>4.1.1.1 Atoms, elements and compounds</p> <p>4.1.1.2 Mixtures</p> <p>4.1.1.3 Model of the atom</p> <p>4.1.1.4 Relative charges of subatomic particles</p> <p>4.1.1.5 Size and mass of atoms</p> <p>4.1.1.6 Relative atomic mass</p> <p>4.1.1.7 Electronic structure</p> <p>4.1.2.1 The periodic table</p> <p>4.1.2.2 Development of the periodic table</p> <p>4.1.2.3 Metals and non-metals</p> <p>4.1.2.4 Group 0</p> <p>4.1.2.5 Group 1</p> <p>4.1.2.6 Group 7</p> <p>4.1.3.1 Properties of transition metals</p> <p><b>Career Links:</b> Research scientist, Particle Physicist</p>	<p><b>4.2 Bonding, structure and properties of matter</b></p> <p>4.2.2.1 States of matter</p> <p>4.2.1.2 Ionic bonding</p> <p>4.2.1.3 Ionic compounds</p> <p>4.2.2.3 Properties of ionic compounds</p> <p>4.2.1.4 Covalent bonding</p> <p>4.2.2.6 Giant covalent structures</p> <p>4.2.3.1 Diamond</p> <p>4.2.3.2 Graphite</p> <p>4.2.3.3 Graphene and fullerene</p> <p>4.2.2.4 Properties of small molecules</p> <p>4.2.1.5 Metallic bonding</p> <p>4.2.2.8 Metals as conductors</p> <p>4.2.2.7 Properties of metals and alloys</p> <p>4.2.2.5 Polymers</p> <p>4.2.4.1 Sizes of particles and their properties</p> <p>4.2.2.2 Uses of nanoparticles</p> <p><b>Career Links:</b> Inorganic chemists, mechanics, engineers, nanoscientists</p>	<p><b>4.4 Chemical changes</b></p> <p>4.4.1.1 Metal oxides</p> <p>4.4.1.2 The reactivity series</p> <p>4.4.1.3 Extraction of metals and reduction</p> <p>4.4.1.4 Oxidation and reduction in terms of electrons</p> <p>4.4.2.1 Reactions of acids with metals</p> <p>4.4.2.2 Neutralisation of acids and salt production</p> <p>4.4.2.3 Soluble salts</p> <p>4.4.2.4 pH scale and neutralisation</p> <p>4.4.2.5 Titrations</p> <p>4.4.2.6 Strong and weak acids</p> <p><b>4.7 Organic chemistry</b></p> <p>4.7.1.1 Crude oil, hydrocarbons and alkanes</p> <p>4.7.1.2 Fractional distillation and petrochemicals</p> <p>4.7.1.3 Properties of hydrocarbons</p> <p>4.7.1.4 Cracking and alkenes</p> <p>4.7.2.1 Structure and formulae of alkenes</p> <p>4.7.2.2 Reactions of alkenes</p> <p>4.7.2.3 Alcohols</p> <p>4.7.2.4 Carboxylic acids</p> <p><b>Career Links:</b> Analytical chemists, pharmacists, chemical engineers, food and flavour scientists</p>
Spring Term	<p><b>4.6 Rate and extent of a reaction</b></p> <p>4.6.1.1 Calculating rates of reaction</p> <p>4.6.1.2 Factors affecting rate</p> <p>4.6.1.3 Collision theory and activation energy</p> <p>4.6.1.4 Catalysts</p> <p>Graph skills, tangents and gradients</p> <p>Required practical activities</p> <p><b>Career Links:</b></p>	<p><b>4.4.3 Electrolysis of ionic compounds</b></p> <p>4.4.3.3 Using Electrolysis</p> <p>4.4.3.4 Electrolysis of aqueous solutions</p> <p>4.4.3.5 Half equations</p> <p><b>4.3 Quantitative</b></p> <p>4.3.1.1 Conservation of mass and balanced equations</p> <p>4.3.1.2 Relative formula mass</p> <p>4.3.1.3 Mass changes</p>	<p>4.7.3.1 Addition polymerisation</p> <p>4.7.3.2 Condensation polymerisation</p> <p>4.7.3.3 Amino acids</p> <p>4.7.3.4 DNA and other naturally occurring polymers</p> <p><b>4.8 Chemical analysis</b></p> <p>4.8.1 Purity, formulations and chromatography</p> <p>4.8.2 Identification of common gases</p> <p>4.8.3 Identify ions by chemical/spectroscopic</p>



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	<p>Research scientist, food chemists, chemical engineers</p>	<p>4.3.1.4 Chemical measurements            4.3.2.1 Moles            4.3.2.2 Amounts of substances in equations            4.3.2.3 Using moles to balance equations            4.3.2.4 Limiting reactants            4.3.2.5 Concentration            4.3.3.1 % Yield</p> <p><b>Career Links:</b>            Inorganic chemists, mechanics, engineers, pharmacists, medics, patent scientists</p>	<p><b>4.10.1 The Earth's resources</b>            4.10.1.1 Using the Earth's resources and sustainable development            4.10.1.2 Potable water            4.10.1.3 Waste water treatment            4.10.1.4 Alternative methods of extracting metals            4.10.2.1 Life cycle assessments            4.10.2.2 Ways of reducing the use of resources</p> <p><b>4.10.3 Using our resources</b>            4.10.3.1 Corrosion and it's prevention            4.10.3.2 Alloys as useful materials            4.10.3.3 Ceramics, polymers and composites</p> <p><b>Career Links:</b>            Analytical chemists, pharmacists, chemical engineers, waste treatment workers, shipbuilders, green chemists, supply chain workers, toxicologist, forensic scientist</p>
<p>Summer Term</p>	<p><b>4.9 Chemistry in the atmosphere</b>            4.9.1.1 Composition and evolution of the atmosphere            4.9.1.3 How oxygen increased and carbon dioxide decreased            4.9.2.1 Greenhouse gases            4.9.2.3 Global climate change            4.9.3.1 Pollutants</p> <p><b>Career Links:</b>            Atmospheric scientists, green chemists, environmental scientists</p>	<p>4.3.3.2 Atom economy            4.3.4 Using Concentration            4.3.5 Volumes of gases</p> <p><b>4.5 Energy Changes</b>            4.5.1.1 Energy transfer during exothermic and endothermic reactions            4.5.1.2 Reaction profiles            4.5.1.3 Energy change of reactions            4.5.2.1 Cells and batteries            4.5.2.2 Fuel cell            4.6.2.1 Reversible reactions            4.6.2.2 Energy changes and reversible reactions            4.6.2.3 Equilibrium            4.6.2.5 Effect of changing conc, temp and pressure</p> <p><b>Career Links:</b>            Inorganic chemists, mechanics, engineers, pharmacists, medics</p>	<p>4.10.4.1 The Haber process            4.10.4.2 NPK fertilisers</p> <p><b>Exam preparation</b></p>



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Overview of KS4 Curriculum			
Subject: GCSE Chemistry (Combined Science)		Exam Board: AQA	
	Year 9	Year 10	Year 11
Autumn Term	<p>All students begin learning GCSE Chemistry content in Year 9. Only topics common to both the Combined and Triple Science pathways are taught in Year 9. Students select which science pathway they wish to pursue for at GCSE in Year 10</p> <p><b>4.1 Atomic structure and the periodic table</b></p> <p>4.1.1.1 Atoms, elements and compounds            4.1.1.2 Mixtures            4.1.1.3 Model of the atom            4.1.1.4 Relative charges of subatomic particles            4.1.1.5 Size and mass of atoms            4.1.1.6 Relative atomic mass            4.1.1.7 Electronic structure</p> <p>4.1.2.1 The periodic table            4.1.2.2 Development of the periodic table            4.1.2.3 Metals and non-metals            4.1.2.4 Group 0            4.1.2.5 Group 1            4.1.2.6 Group 7            4.1.3.1 Properties of transition metals</p> <p><b>Career Links:</b>            Research scientist, Particle Physicist</p>	<p><b>4.2 Bonding, structure and properties of matter</b></p> <p>4.2.2.1 States of matter            4.2.1.2 Ionic bonding            4.2.1.3 Ionic compounds            4.2.2.3 Properties of ionic compounds            4.2.1.4 Covalent bonding            4.2.2.6 Giant covalent structures            4.2.3.1 Diamond            4.2.3.2 Graphite            4.2.3.3 Graphene and fullerene            4.2.2.4 Properties of small molecules            4.2.1.5 Metallic bonding            4.2.2.8 Metals as conductors            4.2.2.7 Properties of metals and alloys            4.2.2.5 Polymers</p> <p><b>Career Links:</b>            Inorganic chemists, mechanics, engineers, nanoscientists</p>	<p><b>4.4 Chemical changes</b></p> <p>4.4.1.1 Metal oxides            4.4.1.2 The reactivity series            4.4.1.3 Extraction of metals and reduction            4.4.1.4 Oxidation and reduction in terms of electrons            4.4.2.1 Reactions of acids with metals            4.4.2.2 Neutralisation of acids and salt production            4.4.2.3 Soluble salts            4.4.2.4 pH scale and neutralisation            4.4.2.6 Strong and weak acids</p> <p><b>4.7 Organic chemistry</b></p> <p>4.7.1.1 Crude oil, hydrocarbons and alkanes            4.7.1.2 Fractional distillation and petrochemicals            4.7.1.3 Properties of hydrocarbons            4.7.1.4 Cracking and alkenes</p> <p><b>Career Links:</b>            Analytical chemists, pharmacists, chemical engineers, food and flavour scientists</p>
Spring Term	<p><b>4.6 Rate and extent of a reaction</b></p> <p>4.6.1.1 Calculating rates of reaction            4.6.1.2 Factors affecting rate            4.6.1.3 Collision theory and activation energy            4.6.1.4 Catalysts            Graph skills, tangents and gradients            Required practical activities</p> <p><b>Career Links:</b>            Research scientist, food chemists, chemical engineers</p>	<p><b>4.4.3 Electrolysis of ionic compounds</b></p> <p>4.4.3.3 Using Electrolysis            4.4.3.4 Electrolysis of aqueous solutions            4.4.3.5 Half equations</p> <p><b>4.3 Quantitative</b></p> <p>4.3.1.1 Conservation of mass and balanced equations            4.3.1.2 Relative formula mass            4.3.1.3 Mass changes            4.3.1.4 Chemical measurements            4.3.2.1 Moles</p>	<p><b>4.8 Chemical analysis</b></p> <p>4.8.1 Purity, formulations and chromatography            4.8.2 Identification of common gases</p> <p><b>4.10.1 The Earth's resources</b></p> <p>4.10.1.1 Using the Earth's resources and sustainable development            4.10.1.2 Potable water            4.10.1.3 Waste water treatment            4.10.1.4 Alternative methods of extracting metals            4.10.2.1 Life cycle assessments</p>



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		<p>4.3.2.2 Amounts of substances in equations 4.3.2.3 Using moles to balance equations 4.3.2.4 Limiting reactants 4.3.2.5 Concentration</p> <p><b>Career Links:</b> Inorganic chemists, mechanics, engineers, pharmacists, medics, patent scientists</p>	<p>4.10.2.2 Ways of reducing the use of resources</p> <p><b>Career Links:</b> Analytical chemists, pharmacists, chemical engineers, waste treatment workers, shipbuilders, green chemists, supply chain workers, toxicologist, forensic scientist</p>
Summer Term	<p><b>4.9 Chemistry in the atmosphere</b> 4.9.1.1 Composition and evolution of the atmosphere 4.9.1.3 How oxygen increased and carbon dioxide decreased 4.9.2.1 Greenhouse gases 4.9.2.3 Global climate change 4.9.3.1 Pollutants</p> <p><b>Career Links:</b> Atmospheric scientists, green chemists, environmental scientists</p>	<p><b>4.5 Energy Changes</b> 4.5.1.1 Energy transfer during exothermic and endothermic reactions 4.5.1.2 Reaction profiles 4.5.1.3 Energy change of reactions 4.6.2.1 Reversible reactions 4.6.2.2 Energy changes and reversible reactions 4.6.2.3 Equilibrium 4.6.2.5 Effect of changing conc, temp and pressure</p> <p><b>Career Links:</b> Inorganic chemists, mechanics, engineers, pharmacists, medics</p>	<p><b>Exam preparation</b></p>



## Chemistry Department – Curriculum Intent

Overview of KS5 Curriculum			
Subject: A Level Chemistry		Exam Board: AQA	
Year 12		Year 13	
	Teacher A	Teacher B	Teacher B
Autumn Term	Physical: 3.1.1 Atomic structure Inorganic: 3.2.1 Periodicity Physical: 3.1.2 Amount of substance <b>Required practical 1a and 1b</b>  <b>Career Links:</b> Analytical chemists, chemical engineers	Physical: 3.1.3 Bonding Physical: 3.1.7 Oxidation, reduction and redox equations Organic: 3.3.1 Introduction to organic chemistry  <b>Career Links:</b> Toxicology, postdoctoral research fellow	Physical: 3.1.10 Equilibrium constant $K_p$ for homogenous systems Physical: 3.1.8 Thermodynamics  <b>Career Links:</b> Analytical chemists, pharmacists, chemical engineers
Spring Term	Physical: 3.1.4 Energetics <b>Required practical 2</b> Physical: 3.1.5 Kinetics <b>Required practical 3</b> Physical: 3.1.6 Chemical equilibria and Le Chatelier's principle  <b>Career Links:</b> Analytical chemists, chemical engineers	Organic: 3.3.2 Alkanes Organic: 3.3.3 Halogenoalkanes Organic: 3.3.4 Alkenes  <b>Career Links:</b> Analytical chemists, pharmacists, chemical engineers, petrochemical industries	Inorganic: 3.2.5 Transition Metals Inorganic: 3.2.6 Reactions of ions in aqueous solution <b>Required practical 12</b>  <b>Career Links:</b> Paint and dye manufacture, environmental chemist, drug developer
Summer Term	Inorganic: 3.2.2 Group 2, the alkaline earth metals Inorganic: 3.2.3 Group 7(17), the halogens <b>Required practical 4</b> <b>Exam preparation</b>  <b>Career Links:</b> Analytical chemists, chemical engineers	Organic: 3.3.5 Alcohols <b>Required practical 5</b> Organic: 3.3.6 Organic analysis <b>Required practical 6</b> <b>Exam preparation</b>  <b>Career Links:</b> Analytical chemists, pharmacists, brewer, chemical engineers, forensic scientists	Physical: 3.1.9 Rate Equations <b>Required practical 7</b> Physical: 3.1.11 Electrode potential and electrochemical cells <b>Required practical 8</b> Physical: 3.1.12 Acids and bases <b>Required practical 9</b> <b>Exam preparation</b>  <b>Career Links:</b> Patent scientists
			Inorganic: 3.2.4 Properties of Period 3 elements and their oxides Organic: 3.3.7 Optical isomerism Organic: 3.3.8 Aldehydes and ketones; 3.3.9 Carboxylic acids and derivatives <b>Required practical 10</b>  <b>Career Links:</b> Drug developer, pharmacologist, synthetic organic chemist
			Organic: 3.3.10 Aromatic Chemistry Organic: 3.3.11 Amines Organic: 3.3.15 Nuclear magnetic resonance spectroscopy Organic: 3.3.16 Chromatography <b>Required practical 11</b>  <b>Career Links:</b> Analytical chemists, pharmacists, chemical engineers, synthetic chemists, forensic toxicologists
			Organic: 3.3.12 Polymers Organic: 3.3.13 Amino acids, proteins and DNA Organic: 3.3.14 Organic synthesis <b>*Required practical 13</b> <b>Exam preparation</b>  <b>Career Links:</b> Analytical chemists, pharmacists, chemical engineers, biochemists, synthetic chemists, sport scientists



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### Curriculum Rationale:

At GCSE and A Level we teach the AQA specification. Staff members are well versed in AQA exam materials, have been teaching AQA for a very long time and we have two members of staff marking for the exam board.

The fundamental principles of Chemistry such as particle theory and chemical reactions are taught as part of the KS3 Science curriculum (see the separate Curriculum Intent document for Science). The teaching of Chemistry as a discrete subject begins in Year 9 and initially focusses on fundamental ideas such as Atomic Structure, The Periodic table and Bonding as these are built upon for the remainder of the GCSE. Development of practical skills occurs progressively through the course, starting with aspects from the Periodic Table study.

In Year 10 students have opted to pursue either Combined Science or Triple Science, and this sees the introduction of more difficult topics such as Electrolysis to enable many more strategies for recall and retrieval, as well as exam practice and addressing misconceptions. Year 11 involves some slightly simpler concepts such as the Earth's Resources topic. The assessments through Year 11 allow opportunities to re-visit and embed topics from Year 10. Practical work has been spread roughly equally in each year to allow for a generous mix of activities throughout the course.

At A level, fundamental concepts of Atomic Structure and Bonding are taught first to allow students to better grasp the later ideas, particularly in the Organic Chemistry section of the course. This is also an opportunity to ease the transition from GCSE where different students have studied either Triple or Combined Science course.

Many combinations of topics (such as Atomic Structure and the Periodic Table) have very clear links which allow the topics to be taught very close together.

Introduction to Organic Chemistry must be taught prior to Alkanes, Alkenes and Alcohols so that essential knowledge of nomenclature and formulae can be built upon. Organic Analysis must be taught at the end of the year so that students are au fait with all the required functional groups.

In Year 13 Equilibrium and  $K_p$ , and Period 3 are seen as 'gateway topics' so are taught first in the year.

NMR Spectroscopy is an extremely challenging topic and is placed strategically so that sufficient Organic Chemistry understanding has already been established, whilst being early enough in the year to re-visit and embed prior to exams. Organic Synthesis is a highly synoptic topic which links almost all areas of Organic Chemistry and so must be taught towards the end of the year.

A-level content is divided roughly into exam paper splits, with Teacher A covering the majority of Paper 1 and Teacher B covering the majority of Paper 2.