January 2024

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	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 **4.1 Atomic structure and the periodic table** 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 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 **Career Links:** Research scientist, Particle Physicist	**4.2 Bonding, structure and properties of matter** 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 4.2.4.1 Sizes of particles and their properties 4.2.2.2 Uses of nanoparticles **4.4.3 Electrolysis of ionic compounds** 4.4.3.3 Using Electrolysis 4.4.3.4 Electrolysis of aqueous solutions 4.4.3.5 Half equations **Career Links:** Inorganic chemists, mechanics, engineers, nanoscientists	**4.4 Chemical changes** 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 4.4.2.5 Titrations 4.4.2.6 Strong and weak acids **4.7 Organic chemistry** 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 4.7.2.1 Structure and formulae of alkenes 4.7.2.2 Reactions of alkenes 4.7.2.3 Alcohols 4.7.2.4 Carboxylic acids 4.7.3.1 Addition polymerisation 4.7.3.2 Condensation polymerisation 4.7.3.3 Amino acids 4.7.3.4 DNA and other naturally occurring polymers **4.8 Chemical analysis** 4.8.1 Purity, formulations and chromatography 4.8.2 Identification of common gases 4.8.3 Identify ions by chemical/spectroscopic **Career Links:** Analytical chemists, pharmacists, chemical engineers, food and flavour scientists

January 2024

Chemistry Department – Curriculum Intent

Spring Term	**4.6 Rate and extent of a reaction** 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 **Career Links:** Research scientist, food chemists, chemical engineers	**4.3 Quantitative** 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 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 4.3.3.2 Atom economy 4.3.4 Using Concentration 4.3.5 Volumes of gases **Career Links:** Inorganic chemists, mechanics, engineers, pharmacists, medics, patent scientists	**4.10.1 The Earth's resources** 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 **4.10.3 Using our resources** 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 **Career Links:** Analytical chemists, pharmacists, chemical engineers, waste treatment workers, shipbuilders, green chemists, supply chain workers, toxicologist, forensic scientist
Summer Term	**Project-based learning** A context driven application of scientific principles to allow for greater appreciation of real-world science.	**4.5 Energy Changes** 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 **4.9 Chemistry in the atmosphere** 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	4.10.4.1 The Haber process 4.10.4.2 NPK fertilisers **Exam preparation**

January 2024

Chemistry Department – Curriculum Intent

		Career Links: Atmospheric scientists, green chemists, environmental scientists, Inorganic chemists, mechanics, engineers, pharmacists, medics	

January 2024

Chemistry Department – Curriculum Intent

Overview of KS4 Curriculum			
Subject: GCSE Chemistry (Combined Science)		**Exam Board:** AQA	
	Year 9	**Year 10**	**Year 11**
Autumn Term	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 **4.1 Atomic structure and the periodic table** 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 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 **Career Links:** Research scientist, Particle Physicist	**4.2 Bonding, structure and properties of matter** 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 **4.4.3 Electrolysis of ionic compounds** 4.4.3.3 Using Electrolysis 4.4.3.4 Electrolysis of aqueous solutions 4.4.3.5 Half equations **Career Links:** Inorganic chemists, mechanics, engineers, nanoscientists	**4.4 Chemical changes** 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 **4.7 Organic chemistry** 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 **4.8 Chemical analysis** 4.8.1 Purity, formulations and chromatography 4.8.2 Identification of common gases **Career Links:** Analytical chemists, pharmacists, chemical engineers, food and flavour scientists
Spring Term	**4.6 Rate and extent of a reaction** 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 **Career Links:** Research scientist, food chemists, chemical engineers	**4.3 Quantitative** 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 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	**4.9 Chemistry in the atmosphere** 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 **4.10.1 The Earth's resources**

January 2024

Chemistry Department – Curriculum Intent

		Career Links: Inorganic chemists, mechanics, engineers, pharmacists, medics, patent scientists	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 **Career Links:** Analytical chemists, pharmacists, chemical engineers, waste treatment workers, shipbuilders, green chemists, supply chain workers, toxicologist, forensic scientist
Summer Term	**Project-based learning** A context driven application of scientific principles to allow for greater appreciation of real-world science.	**4.5 Energy Changes** 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 **Career Links:** Inorganic chemists, mechanics, engineers, pharmacists, medics	**Exam preparation**

January 2024

Chemistry Department – Curriculum Intent

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

January 2024

Chemistry Department – Curriculum Intent

	Career Links: Analytical chemists, chemical engineers	Analytical chemists, pharmacists, brewer, chemical engineers, forensic scientists	**Career Links:** Patent scientists	Analytical chemists, pharmacists, chemical engineers, biochemists, synthetic chemists, sport scientists

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 the 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 and 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.

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.