YEAR 10		AUTUMN TERM				YEAR 10		SPRING TERM				YEAR 10		SUMMER TERM			
POWERFUL IDEAS	**Chemical reactions Amount of substance**	**CEIAG**	A marine biogeochemist, Green aluminium	**Focused retrieval 6 topics**	Year 9 atomic structure Year 9 ions	**POWERFUL IDEAS**	**Chemical reactions Bonding**	**CEIAG**	Food scientist Working with graphene	**Focused retrieval 6 topics**	Year 8 chemical reactions, Periodic Table	**POWERFUL IDEA**	**Organic chemistry Earth and Atmosphere**	**CEIAG**	Working on an oil rig Real life guide to CSI	**Focused retrieval 6 topic**	Chemical changes , analysis
TOPICS	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**	**TOPICS**	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**	**TOPICS**	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**
Chemical changes	pH scale, naming salts, making a pure dry sample of a salt. Products of electrolysis of melts. Aluminium production using electrolysis		Use a filtration apparatus Prepare a pure dry salt Use a water bath Explain why we need an electrolyte Explain why electrodes need replacing during aluminium production		base neutralise soluble electrolysis electolyte electrode anode cathode	**Rate and extent of a chemical reaction**	Rate of a reaction. Collision theory. Changing conditions on rate (including temperature, concentration surface area and catalyst). Reversible reactions. Exothermic and endothermic reactions.		Draw conclusions from graphs. Calculate rate. Identify anomalies. Plan an experiment		exothermic endothermic activation energy catalyst reversible reaction	**Atmosphere**	The atmosphere, the early atmosphere, the greenhouse effect, prodcution of greenhouse gases, global warming, fossil fuels, carbon footprint, other pollutants.		Draw conclusions from graphs. Calculations, calculating mean, appropriate decimal places. Write word and balanced symobl equations.		atmosphere, pollutant carbon footprint, global warming, Greenhouse effect , combustion, climate
Quantitative chemistry	Law of conservation of mass. Uncertainties Mean and range Relative molecular mass Percentage composition Concentration		Balance chemical equations. Use a Bunsen burner, scales, tongs. Represent the measure of uncertainty. Calculate the Mr of a compound when given the Ar for each element. Calculate the percentage of a given element from given data. Convert between cm3 and dm3. Make up a standard solution. Calculate concentration in g/dm3		mean uncertainty anomaly accuracy precision conservation relative concentration composition	**Bonding 2**	Properties of simple covalent molecules. Dot and cross diagrams to represent covalent bonds. Giant covalent substances including diamond and graphite. Properties and structures of fullerenes. Polymers. Structure and properties of metals and alloys		Draw dot and cross diagrams Recognise substances as small molecules, polymers or giant structures from diagrams showing their bonding. Recognise graphene and fullerene from diagrams and descriptions Calculate length to diameter ratio		molecule, covalent, aqueous, polymer, giant covalent, graphene, fullerene, nanotube, delocalised electrons, intermolecular forces, Buckminsterfullerene	**Organic chemistry**	Crude oil, hydrocarbon structure, alkanes. Trends in properties. Fractional distillation. Complete and incomplete combustion.		Draw displayed formulae and structural formulae. Explain how fractional distillation works in terms of evaporation and condensation. Write balanced equations for the complete combustion of hydrocarbons with a given formula		alkane, hydrocarbon, fractional distillation, viscosity, volatility, flammable, combustion, saturated

YEAR 11		AUTUMN TERM				YEAR 11		SPRING TERM				YEAR 11		SUMMER TERM			
POWERFUL IDEAS	Chemical reactions Organic chemistry Amount of substance	**CEIAG**	Lab Technician, Hydrogen cell chemist,	**Focused retrieval 6 topics**	Ionic bonding, Energy in reactions , Year 9 analysis Chemical changes Rates of reaction	**POWERFUL IDEAS**	Organic chemistry Earth's resources Analysis	**CEIAG**	working on an oil rig, SOCO, water quality scientist,	**Focused retrieval 6 topics**	Atomic structure Year 10 quantitative Bonding, Analysis 1	**POWERFUL IDEA**		**CEIAG**		**Focused retrieval 6 topic**	
TOPICS	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**	**TOPICS**	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**	**TOPICS**	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**
Further chemical changes	Electrolysis in solutions, electolysis of brine		Predict electrolysis products, test for gases		brine, electrolysis	**Further Organic chemistry**	Alkenes, alcohols, carboxylic acids, esters,addition polymerisation, condensation polymerisation, natural polymers,		Draw diagrams to represent the formation of a polymer from a given alkene monomer. Write balanced equations for the combustion of alcohols. Draw structural formaulae. Recall the colour change when bromine water reacts with an alkene		homologous, polymerisation, monomer, platicizer, thermosoftening, thermosetting, esterification, polypeptide, amino acid	Summer term is spent completing structured and targeted review and practice of the curriculum				
	Extracting low grade ore, equilibrium		Evaluate biological methods of metal extraction.		phytomining, ore bioleaching, equilibrium,												
	Fuel and chemical cells, transition metals		Evaluate data to compare fuel cells, compare group 1 and transition metals		electochemical cell												
Organic chemistry	Crude oil, hydrocarbon structure, alkanes. Trends in properties. Fractional distillation. Complete and incomplete combustion.		Draw displayed formulae and structural formulae. Explain how fractional distillation works in terms of evaporation and condensation. Write balanced equations for the complete combustion of hydrocarbons with a given formula		alkane, hydrocarbon, fractional distillation, viscosity, volatility, flammable, combustion, saturated	**Earth's Resources**	Finite and renewable resources, using resources, potable water, waste water, life cycle assessments, reduce reuse recycle.		Extract and interpret information about resources from charts, graphs and tables. use orders of magnitude to evaluate the significance of data. Follow instructions and carry out a practical safely. Use a measuring cylinder. Use a balance. Use a Bunsen burner. Carry out simple comparative LCAs. Evaluate the use of resources		finite, sustainibility, synthetic, potable, desalination, sterilising, distillation, evaporate, sedimentation, effluent, anaerobic, aerobic		All students				
													Separate CHEM only				
Quantitative chemistry	Calculating RAM. Percentage composition.		Use Ar values to calculate RAM.		Molecular formula												
	Calculating RAM and rearranging to calculate relative abundancies. The mole. Reacting Masses. Limiting Factors. Empirical formula. Strong and weak acids. Bond energies.		Change the subject of an equation. Use moles=mass/Mr. Apply 'mole' to various problems. Link the limiting reactant to the number of moles. Calculate the change in pH for a given concentration change. Calculate energy changes for a reaction		limiting reactant, strong, weak, dilute, concentrated, exothermic, endothermic	**Chemical Analysis**	Flame tests. Testing with NaOH, Testing for anions Instrumental methods in chemistry		Identify species from the results of flame test. Write balanced equations for the reactions to produce the insoluble hydroxides. Write balanced ionic equations. Identify species from the results of chemical tests. State advantages of instrumental methods compared with the chemical tests		Anion, cation, halide, dilute, precipitate, emission, spectroscopy, spectrum						
	Nanoparticles. Percentage yield. Atom economy. Calculating concentration. Titrations. Moles and gases		Explain and evaluate the properties of nanomaterials relating to their surface area to volume ratio. Use standard form. Calculate yield, percentage atom economy, concentration. Use a burette and pipette.		Nanoparticles, yield, titration, burette, pipette, concordant	**Atmosphere**	Global warming, fossil fuels, carbon footprint, other pollutants.		Draw conclusions from graphs, Write word and balanced symobl equations.		atmosphere, pollutant carbon footprint, global warming, Greenhouse effect , combustion, climate						

YEAR 12		AUTUMN TERM				YEAR 12		SPRING TERM			YEAR 12		SUMMER TERM		
POWERFUL IDEAS	**Amount of substance Organic chemistry Bonding and Shapes of molecules Energy**	**CEIAG**	Work of a pharmacist.: Medical scientist	**Focused retrieval 6 topics**	GCSE calculations GCSE fractional distillation, naming organic molecules GCSE history of the atom GCSE bonding GCSE energy	**POWERFUL IDEAS**	**Organic chemistry Chemical reactions Periodic Table**	**CEIAG**	Atmospheric chemist Photochemist , Fermentation chemist,	**Focused retrieval 6 topics**	Cracking, making haloalkanes GCSE rates of reaction GCSE displacement Ionisation energies	**POWERFUL IDEA**	**Organic Chemistry Analysis Chemical reactions**	**CEIAG**	Industrial placements	**Focused retrieval 6 topic**	Testing gases, anions, cations GCSE CHEM; flame emission spectroscopy, Formation of alcohols Electronic structure, IMF GCSE equilibrium
TOPICS	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**	**TOPICS**	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**	**TOPICS**	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**
Amount of substance	Relative atomic and molecular mass, moles, reacting masses, empirical and molecular formula, balanced equations and associated calculations, Avogadro		Calculations of structured and unstructured mole calcs, use of standard form and ordinary form, appropriate number of sf, rearranging equations, unit conversion, use ratios, fractions and percentages, carry out calculations with Avogadro's, make a volumetric solution, carry out a titration, find a mean, recognize concordant results, weigh by difference, heat to constant mass; use ratios to balance equations, uncertainties		relative atomic mass, relative molecular mass, Avogadro, volumetric solution, ideal gas,	Organic chemistry	free radical substitution, ozone depletion, halogenoalkanes, nucleophilic substitution, elimination, alkenes, electrophilic addition. addition polymers		H- apply CIP priority rules, outline mechansims, test for organic compounds, name polymers and monomers, draw repeating units and polymers,		mechanism, stereoisomerism, free radical, CFC, nucleophile, base, substitution, electrophile, addition, elimination, polymerisation	Organic chemistry	alcohols, oxidation of alcohols, elimination of alcohols,		produce alcohols, test for organic compounds, produce an aldehyde, produce a carboxylic acid, reflux, distil, use [O] in equations		biofuel, fermentation, carbon neutral, reflux, distillation
Organic introduction	Intro to organic, fractional distillation, cracking, pollution, alkanes		draw structural, displayed and skeletal formulas, apply IUPAC rules,		empirical formula, molecular formula, general formula, structural formula, displayed formula, skeletal formula, isomers,	Calorimetry	RP2 calorimetry		Calculation-follow instructions, accurately measuring and recording using appropriate number of significant figures, identify limitations and errors in an experimental procedure, interpreting data, using q=mcT to calculate molar enthalpy, use Hess' cycles, writing half equationsuse an appropriate number of significant figures, follow instruction, construct graphs,c rearranging formulae, Interpreting graphs,	enthalpy, combustion, formation	Spectroscopy	mass spectroscopy, IR spectroscopy, chromatography, 13C and 1H NMR spectroscopy,		use MS, IR and NMR data to analyse compounds, link IR to global warming, separate species using TLC, calculating Rf		spectroscopy, fingerprinting, mobile phase, stationary phase, retention time, chemical shift, integration, tetramethylsilane, splitting, singlet, doublet, triplet, quartet
Atomic structure	Atomic structure, TOF mass spectrometry, electronic structure spdf notation, ionization energies,		Calculation-use an appropriate number of significant figures, interpret and analyse spectra,calculate Ar using isotopic abundances, rearranging formulae, Interpreting graphs,		ionisation, acceleration, ion drift, spectrometry,	Kinetics	kinetics- Maxwell-Boltzmann-effect of temperature, pressure, concentration, surface area, RP3.		Interpreting graphs		kinetics, activation energy, catalyst,	RP4			planning an experiment follow instructions, accurately observing and recording to identify ions.		precipitate, solution
Bonding	bonding-ionic, covalent, metallic, intermolecular forces, shapes of molecules.		explain forces between moleculesdraw diagrams representing structures,		ionic, covalent, macromolecular, intermolecular,	REDOX	oxidation states, half equations REDOX equations		work out oxidation states, combine half equations.		disproportionation, oxidation, reduction, displacement	Equilibrium, Kc	Equilibrium-Le Chatelier, effect of temperature, pressure on equilibrium position, industrial processes, Kc,		Using models, use Le Chatelier's principle to make predictions, explain why a compromise may be needed in industry		equilibrium, compromise,
Energetics	Hess' law formation and combustion using cycles		explain energy changes associated with changes of state		enthalpy, combustion, formation	Inorganic chemistry	Periodicity-trends. Group 2, tests for ions, uses, reactions with water Group 7-displacement test for ions, oxidizing and reducing power, use chlorate		Explain trends in terms of structure and bonding		periodicity, oxidation, reduction, displacement	Equilibrium, Kp	Kp- derive partial pressures using mole fractions, predict qualitative effect of reaction conditions		Use appropriate significant figures		partial pressure, mole fraction

YEAR 13		AUTUMN TERM				YEAR 13		SPRING TERM			YEAR 13		SUMMER TERM		
POWERFUL IDEAS	**Chemical reactions, organic chemistry**	**CEIAG**	Chem and art, chem. engineer, flavour chemist, med. chem., Hair colourants, sustainability chem., polymer ind., material sci,	**Focused retrieval 6 topics**	Maxwell Boltzmann GCSE acids Spectroscopy, alcohols, alkenes,	**POWERFUL IDEAS**	**Periodic table, chemical reactions, energy**	**CEIAG**	net zero, doing a PhD,	**Focused retrieval 6 topics**	Periodic table Chemical reactions Hess' Law, Bond enthalpies, Calorimetry, REDOX reactions	**POWERFUL IDEA**		**CEIAG**		**Focused retrieval 6 topic**	
TOPICS	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**	**TOPICS**	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**	**TOPICS**	**Substantial knowledge (KNOW)**		**Disciplinary Knowledge (KNOW HOW TO)**		**Literacy**
Kinetics	Rate equations, tangents and orders RP7, Arrhenius equation, natural logarithms		Calculation- orders of reaction from data, rearranging equations, plotting graphs, using tangents, collecting and interpreting data, using Arrhenius equation, use concentration –time graphs to determine order, use rate equation to determine rate determining step		Activation energy gradient Arrhenius rate	**Periodicity**	Period 3 elements and oxides, their reactions with water, and structures formed, including pH		Explain the trend in melting point/ water reaction using structure and bonding, Write equations for reactions		oxidation, ionic, covalent, macromolecular	Summer term is spent completing structured and targeted review and practice of the curriculum				
Acid -base equilibria	pH, Kw, Ka, pH curves RP9, buffer action, buffer calculations, logs to the base 10		Convert concentration into pH and reverse, use Kw to calculate pH of strong base, construct expression for Ka and calculate. Link Ka and pKa, sketch and explain titration curve, select appropriate indicators, explain action of buffers, calculate pH of acidic buffer		equilibria titration buffer indicator dissociation concentration	**Transition Metals**	Transition metals-properties, variable oxidation states, titrations, complex ions (shapes/isomerism), colorimetry, hydrolysis and acidity, ligand substitution, catalysis, RP11		Explain chelate effect, perform calculations for titrations using redox equation, explain variable oxidation states and catalysis, explain how tm complexes and ions used as catalysts, explain acidity of complexes, describe test tube reactions		ligand, complex, co-ordination number, substitution, unidentate, bidentate, multidentate, chelate effect, haemoglobin, cis-trans isomerism, cisplatin, square planar, colorimetry					
Organic Chemistry	Aldehydes, ketones, acids, esters, acyl chlorides, anhydrides, optical isomers, aromatic chemistry, amines, polymers, biochemistry, anti-cancer drugs		nucleophilic addition, drawing optical isomers, IUPAC naming of new functional groups, writing reaction equations/conditions, nucleophilic addition-elimination, electrophilic substitution, explaining development of models of Benzene, drawing condensation polymers, repeating units and monomers, reactions of amino acids to make proteins, IMF in proteins, reactions to make DNA, IMF in DNA, action of cisplatin, make and purify organic compounds,		nucleophilic addition, chiral, enantiomer, racemic, esterification, hydrolysis, condensation reaction,	**Electrochemistry**	Electrode potentials and cells, commercial applications of cells and fuel cells		Make and measure the EMF of an electrochemical cell, use EΘ values to predict the direction of simple redox reactions, calculate the EMF of a cell, write and apply the conventional representation of a cell.		electrode potential, oxidation, reduction, oxidising agent, reducing agent, primary cells, secondary cells					
						Thermodynamics	Born Haber cycles, Enthalpy of solution, Gibbs free energy change and entropy change		construct Born–Haber cycles to calculate lattice enthalpies, construct Born–Haber cycles to calculate one of the other enthalpy changes, compare lattice enthalpies from Born–Haber cycles with those from calculations based on a perfect ionic model to provide evidence for covalent character in ionic compounds, construct Born Haber cycles for enthapy of solution and carry out linked calculations, calculations using Gibbs equation.		enthalpy of formation, ionisation energy, enthalpy of atomisation, bond enthalpy, electron affinity, Born Haber, perfect ionic model, Gibbs free energy, entropy,					

Teacher 1

Teacher 2