CHEMISTRY LEARNING PATHWAY

Big Ideas	Year 7	Year 8	Year 9 Autumn	Y9 Spring	Y9 Summer	Year 10 Autumn	Year 10 Spring	Year 10 Summer	Year 11 Autumn	Year 11 Spring	Year 11 Summer	Year 12 Autumn	Year 12 Spring	Year 12 Summer	Year 13 Autumn	Year 13 Spring	Year 13 Summer
Assessments	**End of Each Topic and School Exam in Summer term**	**End of Each Topic and School Exam in Summer term**	**Autumn 2**	**February**	**School Exam**	**Autumn 1, Autumn 2**	**February Topic Test**	**School Exam: Paper 1**	**Autumn 1, Mock Exam Paper 1**	**Spring 1**	**, Practice Mock Paper 2**	**3 module tests, November Formal Assessment**	**Module tests**	**School Exam - AS Paper 1 and AS Paper 2**	**Module tests, November Formal Assessment**	**Module Tests**	**, Practice Mock Papers**
Atoms, Ions, the Periodic Table and Properties	C1.2 Elements and Compounds **(Atoms elements and compounds)**	C2.1 - The Periodic table **(the Periodic Table)**	Topic 1: Atomic Structure, the Periodic Table and Ions 1.1-1.27	Topic 1: Bonding and Properties 1.28-1.42			**Topic 5: Transition Metals 5.1**	Topic 6: Groups of the periodic table 6.1-6.16		Revision of All	Revision of All	2.1.1 Atomic structure & isotopes, 2.2.1 Electron structure, 2.2.2 Bonding structure, 3.1 Periodic table 3.1.1 Periodicity 3.1.2 Group 2 3.1.3 Halogens					
Calculations involving Masses	C1.2 Percent Composition, C1.3 Conservation of Mass	C.2.1 Empirical Formula				Topic 1: Calculations involving Masses 1.43-1.49	Topic 1: Calculations involving Masses 1.50-1.53, **Topic 5: Atom Economy, % Yield, Titration 5.8-5.18**	Revision Topic 1		Revision of All	Revision of All	2.1.1 Calculating relative mass 2.1.3 Amount of a substance (the mole, formulae, reacting masses, gas volumes, percentage yield & atom economy)	Revision of module 2		Kc, Ka, Kw, Arrhenius,	Enthalpy cycles, Entropy, Redox titrations	
States of Matter, Methods of Separating and Purifying Substances	C1.1 Particles, **(Particulate Nature of Matter)**	C1.2 Separations **(Pure and Impure)**	Topic 2 - States of Matter and Methods of Purifying substances 2.1-2.7(c&d)	Methods of Purifying substances 2.7(a,b&e)-2.8	Revision Topic 2	Topic 3: Making Salts and Solubility 3.15-3.21	Revision Topic 2 & 3			Revision All	Revision All		4.2.1 Alcohols - distillation 4.2.2 Haloalkanes - separating funnel	PAG 6 recrystallisation		6.3.1 Chromatography	
Chemical Changes and Materials	C1.3 Reactions, C1.4 Acids **(Chemical Reactions)**	C2.3 Metals and Acids **(Chemical Reactions, Energetics, Materials)**			Topic 4 Extracting Metals 4.1-4.7	Topic 3: Acids and Alkalis , Electrolysis 3.1-3.30	Topic 4: Equilibria 4.13-4.16 (F only), **Topic 5 Corrosion 5.1-5.7 5.19-5.28**	Revision Topic 3, 4&5, 7.1-7.9, Enthalpy	Topic 7: Rate of Reaction 7.1-7.8, **Enthalpy 7.9-7.16** Topic 4: Equilibria 4.13-4.16, Topic 8: Combustion	**Topic 9: Identifying Ions and Photometry 9.1-9.9, Composites**	Revision All	2.1.4 Acids, bases, alkalis & neutralisation, titration) 2.1.5 Redox	3.2 Physical Chem Enthalpy 3.3 Rates of Reaction and Equilibrium Revision of module 2	PAG 6 Rates of Reaction Project,	5.1-4 Rates, Orders, Equilibrium, Acid Calcs, Buffers, Practical 7 Identifying an unknown carbonyl	**5.2 - Energy - Born Haber, Eth Son, Redox, Cell potential, Transition metals and ligands**	
Our Earth and Atmosphere		C1.4 Earth and Atmosphere **(Earth and Atmosphere)**		Topic 2: Potable Water	Topic 4: Mining, Recycling, LCA 4.8-4.12			**Topic 8: Earth and Atmosphere 8.8-8.15, 8.18-8.26**	Topic 8: Earth and Atmosphere 8.8-8.15, 8.18-8.26		Revision All	4.1.2 Combustion of alkanes	4.1.3 Polymers - disposal ; 4.2.2 Haloalkanes & the environment				
Organic Chemistry	C1.3 - Fuels	C2.3 Polymers		Topic 1: Polymers				Revision Topic 1	Topic 8: Fuels, 8.1-8.7, 8.16-8.17 **Topic 9 Alcohols, Carboxylic Aids, Polymers 9.10-9.39**	Revision All	Revision All	4.1.1 Basic concepts of organic chemistry 4.1.2 Alkanes	4.1.3 Alkenes 4.2.1 Alcohols 4.2.2 Haloalkanes	4.2.4 Analytical techniques IR spectroscopy	6.1.1 Aromatic compounds, 6.1.2 Carbonyl compounds, 6.1.3 Carboxylic acids and esters, 6.2.1 Amines, 6.2.2 Amino acids, amides and chirality	6.2.3 Polyesters and polyamides, 6.2.4 Extending the carbon chain, 6.3.2 Spectroscopy	
PHYSICS linked to Chem		Energy - fuels, particle model, energy transfer, structure of the atom, charges of sub-atomic particles.	Atomic structure, Rutherford, electronic configuration, ions (ionising radiation)				Particle model, density, absolute zero			electrical currents							
BIOLOGY linked to Chem	Diffusion	Respiration and photosynthesis word equations and exothermic reactions	Diffusion	Percentage change	Rate of reaction	Fossil record	Respiration and photosynthesis word equations and exothermic reactions Surface area: Volume		Carbon and Nitrogen cycles. Fertilizers								
Big Ideas	**Year 7**	**Year 8**	**Year 9 Autumn**	**Y9 Spring**	**Y9 Summer**	**Year 10 Autumn**	**Year 10 Spring**	**Year 10 Summer**	**Year 11 Autumn**	**Year 11 Spring**	**Year 11 Summer**	**Year 12 Autumn**	**Year 12 Spring**	**Year 12 Summer**	**Year 13 Autumn**	**Year 13 Spring**	**Year 13 Summer**
Skills: Practical	Boiling, Freezing, Evaporating, Physical vs Chemical Change, combustion, endo/exo	Demo Group 1 reactions, Group 7 Reactions and Metals vs Non-metals, Empirical Formula, Chromatography, Distillation, Filtration, Evaporation, Metal Displacement, Indicators, Neutralisation, Gas Tests	Filtration, Evaporation	Chromatography, Distillation	Metal Displacement	Indicators, Neutralisation, Making Salts, Electrolysis	Empirical formula prac**, Titration**	Group 1 reactions with water, Group 7 displacement reactions.	Rates, Cracking, **Testing for Alkenes**, **Calorimetry**	Revision of all		PAG 1 Calculating empirical formula, PAG 2 Acid base reactions, PAG 1 Gas, PAG 8 Enthalpy of reaction collection, PAG 2 titration	PAG 5 oxidation of alcohols, PAG 5 dehydration of alcohols, PAG 7 rate of hydrolysis, PAG 5 making a haloalkane, Pag 4 Halogen Displacement, Pag 4 Halide ion testing, PAG 10 Rate Temp, Pag 4-5 Equilibrium	PAG 12 investigation of synthesis of aspirin, PAG 6 synthesis of aspirin,	PAG 6 - Investigating Rates Research PAG7 Identifying an unknown carbonyl, Practical 9 Chromatography	PAG 8 Electrochemistry, PAG 12 Redox Titration, PAG 3 Enthalpy of Solution, Pac 6 Ligand Substitution, PAG 9 Identifying Ions	
Disciplinary knowledge	C1.1 L6 hypothesis, variables, conclusion/ C1.2 L1 & 2 scientific discovery of atoms/ C1.3 L1 discovery of plastics in context of chem reactions, L3 future of H2 cars in context of combustion, hypothesis, variables, interpretation of results, L4 interpreting results, L5 dev of con' of mass theory in light of content, interpreting results, L6 equipment, measurements/ C1.4 pH measurements, safety		Justifying method steps/ Safety & Risks / Equipment/ Improvements to method for validity/ Interpreting results.	Development of atomic structure and periodic table theory using evidence to revise theories		Justifying method steps/ Safety & Risks / Equipment/Variables/ Improvements to method for validity/ Interpreting results.	Methods steps/ Interpreting results from tables (**Equipment, Errors & improvements**).	Using experimental results/observations of Gp1&7 to suggest theories on reactivity. Evidence revising climate change causes	Equipment, variables, interpreting results/graphs, diagrams. **Validity, safety, justifying method steps**	Revision of all	All PAGs focus on students using equipment and chemicals safely, handling equipment with dexterity & utilising independently. Students complete the practical in line when content is taught and complete follow up interpretation results that get them to draw conclusions and complete additional questions that clearly link the disciplinary knowledge to the substantive.					
Skills: Maths	Percent Composition, Conservation of mass, RFM, Cooling Curves, Interpreting melting points, Graph Skills, Interpreting pH Scales, Calculating Differences, Recording Results	Interpreting data tables and bar charts, Empirical Formula, Percent Composition, Rf, Calculating Differences	Cooling Curves, Interpreting melting points, Rf, % Composition, Deducing the structure of atoms, and ion, RAM, Protons, Neutrons and Electrons	Dot-cross diagrams			Empirical Formula, Moles, reacting masses, RFM, Proportions**, Atom Economy, % Yield, Titration, gas volume, concentration**	Trends in data, positive and negative numbers	Graph interpretation, tangents, proportionality, bond enthalpy, Supply and Demand, **Atom Economy, Percentage Yield, Bond Enthalpy, Calorimetry**	Revision of all		2.1.3 Amount of a substance (the mole, formulae, reacting masses, gas volumes, percentage yield & atom economy) enthalpy,	graph analysis, initial rate, instantaneous rate, Kc, bond enthalpy Revision of module 2	Revision of module 2, rates graphs, half-life, tangents	**Rates, Tangents, half-life, ln, Ka, Kc, kw, pka, ph.**	Enthalpy cycles, redox titrations	
Chemical Equations	Word Equation: Intro symbol equations	Word and Symbol Equations		Ionic Formulae	Metal Displacement	Neutralisation & Electrolysis Half equations and net ionic equations		Group 1 & Group 7 Half equations and net ionic equations				2.1.2 Formulae & equations 2.1.5 Redox 4.1.2 Alkanes radical substitution	4.1.3 Alkenes electrophilic addition 4.2.1 Alcohols oxidation, dehydration 4.2.2 Nucleophilic substitution	Revision of equations	Buffers	redox equations, ligand substitution	
Personal Development																	
British values	C1.1, C1.3 scientists sharing ideas C1.3 Latin use of chem names																
CIEAG *** Current yr 8,9 had 2x career lessons	C1.1 nanoparticle scientist, C2.1 use of argon in anaesthesia,	C2.2 chem engineering & separation techniques, C2.3 chem engineer in plastic disposal and composite design	T1 nuclear medicine tech	T1 Metallurgist	T4 Pharmacologist		T1 job profiles	T6 smashing stereotypes	T7 catalyst chem engineers, medical engineer, EDF energy power station engineer			computational molecular modelling	spectroscopy in a suitcase UoB			gas chromatography analysis, NMR analysis, radiographers & MRI	
SMSC	C1.3use of hydrogen fuel cells, C1.4 indigestion remedies	C2.1 use of chlorine in warfare/water & displacement shown in migration, C2.2 filtration in water treatment in UK Vs abroad, C2.2 chromatography extraction of Vit A for food supplements, C2.3 mining the ocean floor, C2.4 climate change	T1 isotopes and atomic bombs				T5 use of fuel cells, use of fertilisers, titration calculations in industry	T6 chlorine in war fare and water, Ar in surgery, T8 global warming and climate change	T8 Gulf oil spill, CO detectors, coal factories			isotopes and atomic bombs	testing quality of water linked to intensive farming in USA		Thalidomide, oceans becoming acidic & coral bleaching	Use of cis-platin in cancer drug development, fuel cells, toxic batteries, use of copper	
Extra Curricula	half termly themed clubs											UoB lectures, podcast club			UoB lectures, podcast club		
Cultural capital	C1.1 2 hr marathon record & materials, bpt at altitude, C1.2 History of atom, scientific history, compound discovery in medicine, C1.3 Plastic discovery, C1.4 pH scale invention,	C2.1 use of metal as building material, C2.3 Hindenburg disaster, Staffordshire hoard, C2.3 stone Vs iron age and mines, C2.3 terracotta army, C2.4 Felix Baumgartner jump from space, C2.4 Greta Thunberg, recycled metal Tokyo 2020 medals	T1 comedy why we study atoms, History of atom, ions in batteries	Damien Hurst art	T4 Staffordshire hoard, Hindenburg disaster, mining ocean floor, salts of Mali, recycled metals used for Tokyo 2020 medals	T3 salts of Mali, indigestion tablets, desulfurisation in coal factories, neutralisation in real life, copper as a commodity	T1 mole day	T6 tech developments for C extraction	T7 factory explosions, inc custard factory, linked to dust, Chernobyl accident	T9 alcohol fermentation, nano technology, water purity		isotopes and floating ice link to climate, graphene discovery, ions in batteries, history of the periodic table	A brief history of alcohol in human society		use of benzene, nitrobenzene and chlorobenzene, phenols & other organic compounds. History of aspirin. Reaction mechanisms and kinetics link to drug synthesis	iron in blood	
Equality and Diversity *** Current yr 8 & 9 have done 2x E&D lessons	C1.3 discovery of element country recognition, C2.2 solubility re: medicines																