Year 13 Chemistry Curriculum Map

Overview	Year 13 Physical chemistry starts revisiting the concept of equilibrium and applying it to the gas phase. The first big physical Chemistry topic is related to acids and bases which are important in domestic, environmental and industrial contexts. Acidity in aqueous solutions is caused by hydrogen ions and a logarithmic scale, pH, has been devised to measure acidity. Buffer solutions, which can be made from partially neutralised weak acids, resist changes in pH and find many important industrial and biological applications. The study of Electrochemistry leads to electrochemical cells which have very important commercial applications as a portable supply of electricity to power electronic devices such as mobile phones, tablets and laptops. On a larger scale, they can provide energy to power a vehicle. The further study of thermodynamics builds on the Energetics section and is important in understanding the stability of compounds and why chemical reactions occur. Enthalpy change is linked with entropy change enabling the free-energy change to be calculated. Inorganic chemistry starts with the study of the properties and reactions of the Period 3 oxides. Unlike the metals in Groups 1 and 2, the transition metals Ti to Cu form coloured compounds and compounds where the transition metal exists in different oxidation states. Some of these metals are familiar as catalysts. The properties of these elements are studied in this section with opportunities for a wide range of practical investigations. The reactions of transition metal ions in aqueous solution provide a practical opportunity for students to show and to understand how transition metal ions can be identified by test-tube reactions in the Laboratory. Organic chemistry, starting with the introduction to Aromatic chemistry, takes benzene as an example of this type of molecule and looks at the structure of the benzene ring and its substitution reactions. The study of Amines then leads to the revisiting of polymer chemistry which is extended to include condensation polymers. The ways in which condensation polymers are formed are studied, together with their properties and typical uses. Problems associated with the reuse or disposal of both addition and condensation polymers are considered. Amino acids, proteins and DNA are the molecules of life. The structure and bonding in these molecules and the way they interact is studied. Drug action is also considered. The synoptic view of organic chemistry is now explored with the formation of new organic compounds by multi-step syntheses using reactions included in the specification is covered in this section. Chemists use a variety of techniques to deduce the structure of compounds, nuclear magnetic resonance spectroscopy is added to mass spectrometry and infrared spectroscopy as an analytical technique. The emphasis is on the use of analytical data to solve problems rather than on spectroscopic theory. Chromatography provides an important method of separating and identifying components in a mixture, this is the final topic studied.					
Year 13	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Periodicity 2 Equilibrium of gases	Acids, bases and Buffers Aromatic Chemistry	Electrochemistry Amines Polymers	Amino acids, proteins, DNA Synthesis Transition Metals	Structure determination Chromatography Ions in aqueous solution Thermodynamics	Revision for A Level exams
Knowledge	Properties of the period 3 elements and their oxides Equilibrium constant, kp	Brønsted–Lowry acid–base equilibria in aqueous solution Definition and determination of pH	Electrode potentials and cells Commercial applications of electrochemical cells Preparation of amines	Amino acids Proteins Enzymes DNA	Nuclear magnetic resonance spectroscopy Chromatography Reactions of ions in aqueous solution	

		The ionic product of water Weak acids and bases Ka for weak acids pH curves, titrations and indicators Buffer action Bonding in aromatic molecules Electrophilic substitution mechanism	Nucleophilic properties of amines Base properties of amines Condensation polymers Biodegradability and disposal of polymers	Action of anticancer drugs Organic Synthesis General properties of transition metals Substitution reactions Shapes of complex ions Variable oxidation states Formation of colured ions Catalysts	Born Haber Cycles Gibbs free energy	
Skills	Carry out reactions of elements with oxygen and test the pH of the resulting oxides Calculate the partial pressures of reactants and products at equilibrium. Calculate the value of an equilibrium constant Kp	Carry out pH calculations Plot pH curves to show how pH changes during reactions Prepare and test a buffer solution with a specific pH value. Make appropriate mathematical approximations in buffer calculations Carry out the preparation of methyl 3-nitrobenzoate by nitration of methyl benzoate, purification by recrystallisation and determination of melting point.	Make simple cells and use them to measure unknown electrode potentials Plan and carry out an experiment to investigate the effect of changing conditions Use E$^{\ominus}$ values to predict the direction of simple redox reactions, then test these predictions by simple test-tube reactions. Making nylon 6,6 Research problems associated with the disposal of different polymers.	Draw the shape of complex ions Determine the concentration of a solution of copper(II) ions by colorimetry Carry out redox titrations Investigate Mn^{2+} as an autocatalyst	Use data in the Chemistry Data Booklet to suggest possible structures for molecules Use thin-layer chromatography to identify analgesics. Use thin-layer chromatography to identify transition metal ions in a solution. Carry out test-tube reactions to identify the positive and negative ions in this specification as well as the reactions of metal-aqua ions with NaOH, NH_3 and Na_2CO_3 Identify unknown substances using reagents Students could be asked	

					to find ΔS for vaporization of water using a kettle. Rearrange the equation $\Delta G = \Delta H - T\Delta S$ to find unknown values. Determine ΔS and ΔH from a graph of ΔG versus T	
Assessment	September resit – all Year 12 content	Autumn Test – all Year 13 content covered so far	Mock Exam All Year 13 content covered so far	Papers 1 – 3 after school mocks	Papers 1 – 3 after school mocks	