OCR Chemistry (A) A-Level 2 year Long Term Plan

Assessment Objectives

AO1: Demonstrate knowledge and understanding of scientific ideas, processes, techniques and procedures.

AO2: Apply knowledge and understanding of scientific ideas, processes, techniques and procedures:

a. in a theoretical context
b. in a practical context
c. when handling qualitative data
d. when handling quantitative data.

AO3: Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to:

a. make judgements and reach conclusions
b. develop and refine practical design and procedures.

Year 12 - Scientific skills

1. **How Science Works skills identified and developed through teaching and learning**
   - **i.** Use theories, models and ideas to develop scientific explanations
   - ii. Use knowledge and understanding to pose scientific questions, define scientific problems, present scientific arguments and scientific ideas
   - iii. Use appropriate methodology, including information and communication technology (ICT), to answer scientific questions and solve scientific problems
   - iv. Carry out experimental and investigative activities, including appropriate risk management, in a range of contexts
   - v. Analyse and interpret data to provide evidence, recognising correlations and causal relationships
   - vi. Evaluate methodology, evidence and data, and resolve conflicting evidence
   - vii. Know that scientific knowledge and understanding develops over time
   - viii. Communicate information and ideas in appropriate ways using appropriate terminology
   - ix. Consider applications and implications of science and evaluate their associated benefits and risks
   - x. Consider ethical issues in the treatment of humans, other organisms and the environment
   - xi. Evaluate the role of the scientific community in validating new knowledge and ensuring integrity
   - xii. Evaluate the ways in which society uses science to inform decision making.

2. **Mathematical skills identified and developed through teaching and learning**
   - **i.** arithmetic and numerical computation - Recognise and make use of appropriate units, expressions in decimal and standard form. Ratios, fractions, percentages and estimations. Use calculators to find and use power.
   - ii. handling data - Use an appropriate number of significant figures. Find arithmetic means. Identify uncertainties in measurements and use simple techniques to determine uncertainty when data are combined.
   - iii. algebra - Understand and use the symbols =, <, <<, >>, >, ∝, ~. Change the subject of an equation, substitute numerical values into algebraic equations, solve algebraic equations.
   - iv. graphs - Translate information between graphical, numerical and algebraic forms. Plot two variables from experimental or other data. Draw and use the slope of a tangent to a curve as a measure of rate of change
   - v. geometry and trigonometry - Use angles and shapes in regular 2-D and 3-D structures. Visualise and represent 2-D and 3-D forms including 2-D representations of 3-D objects. Understand the symmetry of 2-D and 3-D shapes.

3. **Transferable learning skills (developed throughout)**

i. structure independent study time between lessons to complete teacher set consolidation tasks and pre reading to deadline.
ii. build the habit of returning to prior learning to consolidate, deepen the understanding and reapplying it in familiar contexts.
iii. to establish note taking and retrieval revision habits outside of the classroom.
iv. self mark work, in green pen, adding modelled solutions where needed both in class and independently using mark schemes.
v. use teacher provided feedback to identify gaps in knowledge and target those areas in private study.

Year 13 - Scientific skills

1. **How Science Works skills identified and developed through teaching and learning**
   i. Use theories, models and ideas to develop scientific explanations
   ii. Use knowledge and understanding to pose scientific questions, define scientific problems, present scientific arguments and scientific ideas
   iii. Use appropriate methodology, including information and communication technology (ICT), to answer scientific questions and solve scientific problems
   iv. Carry out experimental and investigative activities, including appropriate risk management, in a range of contexts
   v. Analyse and interpret data to provide evidence, recognising correlations and causal relationships
   vi. Evaluate methodology, evidence and data, and resolve conflicting evidence
   vii. Know that scientific knowledge and understanding develops over time
   viii. Communicate information and ideas in appropriate ways using appropriate terminology
   ix. Consider applications and implications of science and evaluate their associated benefits and risks
   x. Consider ethical issues in the treatment of humans, other organisms and the environment
   xi. Evaluate the role of the scientific community in validating new knowledge and ensuring integrity
   xii. Evaluate the ways in which society uses science to inform decision making.

2. **Mathematical skills identified and developed through teaching and learning**
   i. arithmetic and numerical computation - Recognise and make use of appropriate units, expressions in decimal and standard form. Ratios, fractions, percentages and estimations. Use calculators to find and use power, exponential and logarithmic functions.
   ii. handling data - Use an appropriate number of significant figures. Find arithmetic means. Identify uncertainties in measurements and use simple techniques to determine uncertainty when data are combined.
   iii. algebra - Understand and use the symbols =, <, <<, >>, >, ∝, ~. Change the subject of an equation, substitute numerical values into algebraic equations, solve algebraic equations. Use logarithms in relation to quantities that range over several orders of magnitude.
   iv. graphs - Translate information between graphical, numerical and algebraic forms. Plot two variables from experimental or other data. Determine the slope and intercept of a linear graph. Determine the slope and intercept of a linear graph. Draw and use the slope of a tangent to a curve as a measure of rate of change
   v. geometry and trigonometry - Use angles and shapes in regular 2-D and 3-D structures. Visualise and represent 2-D and 3-D forms including 2-D representations of 3-D objects. Understand the symmetry of 2-D and 3-D shapes.

3. **Transferable learning skills (developed throughout)**
   i. structure independent study time between lessons to complete teacher set and personalised consolidation tasks as well as pre reading to deadline.
   ii. refine the habit of returning to prior learning to consolidate, deepen the understanding and reapplying it in complex and less familiar contexts.
   iii. to further develop note taking and retrieval revision habits outside of the classroom. Developing the ability to apply appropriate spacing techniques to maximise the benefit from revision time.
   iv. self mark work, in green pen, adding modelled solutions where needed both in class and independently using mark schemes.
   v. develop as a self aware learner, able to identify gaps in knowledge and target those areas in private study.

Rationale for the sequencing of texts and skills across the course

At Lipson we follow OCR Chemistry A. The course uses a content-led approach, enabling a flexible approach to the teaching order. It is laid out clearly in a series of teaching modules, is co-teachable, and embeds practical requirements and skills within the teaching modules. The Chemistry course has been carefully sequenced to allow a natural transition from GCSE to A level and is designed to enable two teachers to teach different topics simultaneously. This aids memory retention and understanding through spacing out knowledge acquisition, retrieval and memory retention.

At the start of year 12 one teacher delivers a topic called ‘foundations in chemistry’, and as its name suggests, is the foundations required to access the course and is a continuation of skills learnt at GCSE. The topics taught thereafter reflect and develop on previous knowledge from GCSE whilst also developing a strong basis on which to build future learning i.e. the content delivered in year 13. For example, ‘amount of substance’ is taught in GCSE, then the module ‘amount of substance’ is taught at the start of year 12, and then is built upon in year 13 in the module ‘Equilibrium’. This transition into and through the A level course provides students with the confidence and knowledge required to be successful in future topics.

Throughout the course the sequence is well structured and coherent to help students manage with the increased knowledge demand of the topics. For example, rates of reactions is taught in Year 13 and requires an understanding of Equilibria (taught in year 12 - half-term 6), which itself requires a good understanding of intermolecular forces (Year 12 - half-term 4), electron structure (half-term 3) and reacting quantities (half-term 2)

The course has been designed so that it can be taught by two teachers at both year 12 and year 13 independently of each other. The content of these modules does overlap, but they can be taught separately. As such, the year 12 content and year 13 content is taught as per the recommendation of the specification. The course is separated into six modules; one practical based (development of practical skills in chemistry) and five content based (foundations in chemistry, Periodic table and energy, core organic chemistry, physical chemistry and transition elements & organic chemistry and analysis)..

Of the five content modules (modules 2-6), three are delivered in year 12 and two in year 13. The modules taught in each year are then split between two teachers in year 12 with each teacher taking one module at a time. In year 13 one teacher delivers all content. These modules are each then split into chapters. The chapters are designed, in the specification, to follow on from one another in each module; as such, these chapters are taught sequentially. Module 1 is taught throughout the course, the skills are incorporated where relevant. Module 2 (foundations in chemistry) is specifically taught before modules 3-6 so that the skills learned can be applied to the content being taught. The course has been planned so that teaching finishes by Easter, allowing adequate time for reviewing content and skills, and preparing for exams.

The course is designed to enthuse students and develop not just a passion for chemistry but young adults with the ability to succeed at undergraduate level. Transferable skills are equally as important as academic understanding and students develop their cognitive, interpersonal and intrapersonal skills throughout the course, enabling them to meet the demands of further and higher education. The coherent mapping of content alongside disciplinary skills helps to develop young scientists equipped with a comprehensive set of skills to ensure future success, particularly in the physical sciences.

A Level Chemistry Y12 LTP

Teacher 1: Two hours per week

Half-Term 1:	**Half-Term 2:**	**Half-Term 3:**	**Half-Term 4:**	**Half-Term 5:**	**Half-Term 6:**
Module 2: Foundations in chemistry This module acts as an important bridge into AS and A Level Chemistry from GCSE level. It allows learners to develop important quantitative techniques involved in measuring masses, gas and solution volumes, including use of volumetric apparatus. Learners are also able to develop their mathematical skills during their study of amount of substance. 2.1 Atoms and reactions 2.1.1 Atomic structure and isotopes 2.1.2 Compounds, formulae and equations	**Module 2: Foundations in chemistry** 2.1 Atoms and reactions 2.1.3 Amount of substance 2.1.4 Acids 2.1.5 Redox	**Module 2: Foundations in chemistry** 2.2 Electrons, bonding and structure 2.2.1 Electron structure 2.2.2 Bonding and structure	**Module 3: Periodic table and energy** This module provides learners with a knowledge and understanding of the important chemical ideas that underpin the study of inorganic and physical chemistry. It allows learners to develop important qualitative practical skills, especially observational skills required for analysis, and accurate quantitative techniques involved in determination of energy changes and reaction rates. 3.1 The periodic table 3.1.1 Periodicity 3.1.2 Group 2 3.1.3 The halogens	**Module 3: Periodic table and energy** 3.1 The periodic table 3.1.4 Qualitative analysis 3.2 Physical chemistry 3.2.1 Enthalpy changes	**Module 3: Periodic table and energy** 3.2 Physical chemistry 3.2.2 Reaction rates
	PAG 1 - Moles determination **PAG 2 - Acid-base titration**		**PAG 4 - Qualitative analysis of ions**	**PAG 3 - Enthalpy determination** **PAG 4 - Qualitative analysis of ions**	**PAG 9 - Rates of reaction - continuous monitoring method**

Teacher 2: Three hours per week

Half-Term 1: **Module 4: Core organic chemistry** This module introduces organic chemistry and its important applications to everyday life. Learners are provided an opportunity to develop important organic practical skills. 4.1 Basic concepts and hydrocarbons 4.1.1 Basic concepts of organic chemistry	**Half-Term 2:** **Module 4: Core organic chemistry** 4.1 Basic concepts and hydrocarbons 4.1.2 Alkanes 4.1.3 Alkenes	**Half-Term 3:** **Module 4: Core organic chemistry** 4.1 Alcohols, haloalkanes and analysis 4.2.1 Alcohols 4.2.2 Haloalkanes	**Half-Term 4:** **Module 4: Core organic chemistry** 4.1 Alcohols, haloalkanes and analysis 4.2.3 Organic synthesis	**Half-Term 5:** **Module 4: Core organic chemistry** 4.1 Alcohols, haloalkanes and analysis 4.2.4 Analytical techniques	**Half-Term 6:** **Module 3: Periodic table and energy** 3.2 Physical chemistry 3.2.3 Chemical equilibrium
	PAG 7 - Qualitative analysis of organic functional groups	**PAG 7 - Qualitative analysis of organic functional groups**	**PAG 5 - Synthesis of an organic liquid**		

A Level Chemistry Y13 LTP

Teacher 1:

Half-Term 1: **Module 5: Physical chemistry and transition elements**	**Half-Term 2:** **Module 6: Organic chemistry and analysis**	**Half-Term 3:** **Module 6: Organic chemistry and analysis**	**Half-Term 4:** **Module 5: Physical chemistry and transition elements**	**Half-Term 5:** **Exam preparation and revision**	**Half-Term 6:** **Exam preparation and revision**
The content in this module assumes knowledge from modules 2 & 3. This module extends the study of; energy, reaction rates and equilibria, and the periodic table. 5.1 Rates, equilibrium and pH 5.1.1 How fast? 5.1.2 How far? 5.1.3 Acids, bases and buffers	The content in this module assumes knowledge from modules 2 & 4. This module introduces several new functional groups and emphasises the importance of organic synthesis 6.1 Aromatic compounds, carbonyls and acids 6.1.1 Aromatic compounds 6.1.2 Carbonyl compounds 6.1.3 Carboxylic acids and esters	6.2 Nitrogen compounds, polymers nd synthesis 6.2.1 Amines 6.2.2 Amino acids, amides and chirality 6.2.3 Polyesters and polyamides 6.2.4 Carbon-carbon formation 6.2.5 Organic synthesis 6.3 Analysis 6.3.1 Chromatography and qualitative analysis 6.3.2 Spectroscopy	5.2 Energy 5.2.1 Lattice enthalpy 5.2.2 Enthalpy and entropy 5.2.3 Redox and electrode potentials 5.3 Transition elements 5.3.1 Transition elements 5.3.2 Qualitative analysis		
PAG 9 - Rates of reaction - continuous monitoring method **PAG 10 - Rates of reaction - initial rates method** **PAG 11 - pH measurement**	PAG 7 - Qualitative analysis of organic functional groups	PAG 6 - Synthesis of an organic solid	PAG 8 - Electrochemical cells PAG 4 - Qualitative analysis of ions		