Cowes Enterprise College
An Ormiston Academy
Educate for life

KEY
Foundations in chemistry
Periodic table and energy
Core organic chemistry
Physical chemistry
Organic chemistry
Cross curricular

CHEMISTRY KS5

Physics, Maths

Atoms, ions and compounds

How do sub-atomic particles differ between atoms, ions and isotopes and how are ions used to construct compound formulae?

How can percentages for isotopic abundance be used to calculate relative atomic mass?

Physics, Maths

Amount of substance

How many atoms are contained in one mole and how can you use mass to calculate number of atoms present?

How can experimental data be used to calculate the empirical formulae of differing compounds?

Periodicity

How can bonding and structure explain recurring trends across consecutive periods of the periodic table?

What is ionisation energy and how can you use atomic structure to explain it?

YR12

Physics, Maths

Electrons and bonding

How are electrons distributed in orbitals between sub-shells?

How are ionic and covalent structures different and how is electron structure linked to their bonding?

Physics, Maths

Shapes of molecules and intermolecular forces

How are electron pairs involved in determination of the 3D shape of a molecule?

How do intermolecular forces form between compounds and what dictates their differing strengths?

Acids and redox

How can you use the formulae of compounds to determine oxidation number, thus highlighting if a reaction is an example of redox?

What is the correct way to display titration results and how do you then calculate concentration of a solution?

Physics, Maths, Geography

Enthalpy: measuring enthalpy changes

How do you measure energy change experimentally use these values to determine enthalpy change?

What equations can be constructed to represent enthalpy changes of combustion and formation?

Reactivity trends

What are the patterns of reactivity in groups 2 and 7, and how can this be demonstrated experimentally?

What qualitative tests can be carried out to identify anions and cations, and how can ionic equations be written for these?

Physics, Maths, Geography

Alkanes

What properties do alkanes possess and why does variation in structure affect boiling point?

What steps are involved in the free radical substitution reactions of alkanes and halogens?

Basic concepts of organic Chemistry

What is the nomenclature for displaying and naming organic compounds?

How do reaction mechanisms explain the order of events within a specific chemical reaction?

Maths

Enthalpy: analysing enthalpy cycles

How can bond enthalpies be used to determine enthalpy change of reaction?

What is Hess' law and how can you construct enthalpy cycles to determine enthalpy change?

Technology

Reaction rates

How can rate results be plotted and how does gradient be used to determine rate of reaction?

How does the Boltzmann distribution explain the impact of catalyst and temperature changes on rate?

Maths

Alkenes

How does the double bond in alkenes lead to stereoisomerism?

How can you construct the electrophilic addition mechanism to show bromination of an alkene?

Technology

Alcohols

What are the differences in structure between primary, secondary and tertiary alcohols?

What are the oxidation products of alcohols and why is reflux necessary for this process?

Maths

Equilibrium, Kc and Kp

How can equilibrium amounts of substance be determined and then used to calculate Kc with correct units?

How can pressures in a system be used to calculate a value for Kp in a gaseous equilibrium?

Spectroscopy

How is fragment ion data from mass spectroscopy used to determine a structural formula?

How an infrared spectroscopy be used to identify functional groups within a molecule?

Maths

Equilibrium

How does le Chatelier's principle explain the shift of equilibrium position in a reversible reaction?

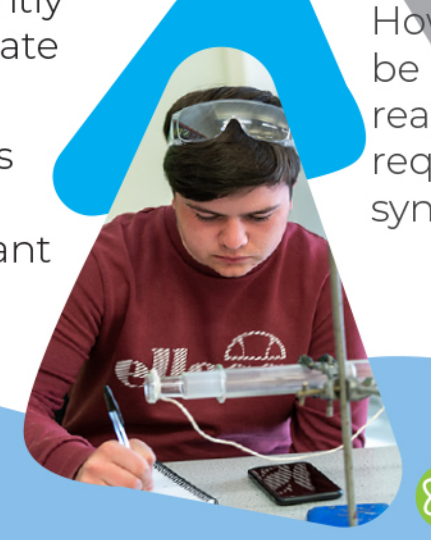
How can an equilibrium equation be used to generate a Kc expression?

Maths

Rates of reactions and rate equations

How are orders of reaction determined from experimental data, and subsequently used to generate a rate equation?

How is the Arrhenius equation applied to calculate rate constant from experimental data?



Organic synthesis

How can various practical techniques be used to purify and dry samples of organic product?

How can synthetic pathways be used to determine the reagents and conditions required for multi-step synthesis?

Maths

Haloalkanes

How can a curly arrow diagram explain the nucleophilic substitution of haloalkanes?

How does homolytic fission begin the process of ozone depletion in the atmosphere?

Maths

Enthalpy and entropy

How are Born-Haber cycles used to determine lattice enthalpy?

What is entropy a measure of and how can Gibbs' free energy be calculated to indicate feasibility of a reaction?

Maths, Biology

Acids, bases and pH

How is concentration of H+ ions used to calculate pH of strong acids, weak acids and strong alkalis?

What is the Ka dissociation constant and how do you construct Ka expressions?

Maths, Biology

Buffers and neutralisation

What is a buffer solution and how does it defend against pH change?

How do you calculate pH of a buffer through partial neutralisation using a rearranged Ka expression?

YR13

Maths

Redox and electrode potentials

What are manganite (VII) redox titrations and how are oxidation numbers crucial to the concentration calculations?

How do you make an electrochemical cell and how are these adapted to generate voltage in a fuel cell?

Maths, Biology

Transition elements

What types of stereoisomerism exist in transition metal complexes and how are they represented in 3D diagrams?

What observations are recorded when transition metal complexes undergo ligand substitution, precipitation and redox reactions?

Maths, Biology

Aromatic chemistry

What properties disprove the Kekule structure of benzene and how does it engage in electrophilic substitution?

What are the differences between benzene and phenol and what reactions can phenol undergo?

Biology

Amines, amino acids and polymers

What structure do amino acids have, and how do they demonstrate chirality through the central carbon?

How do addition and condensation polymers differ and how can they each be represented as a repeat unit?

Chromatography and spectroscopy

How do the mobile and stationary phases allow for separation of samples in gas, paper and thin layer chromatography?

What are the differences between C13 and H+ NMR and how are the spectra used to identify and construct molecules?

Biology

Carbonyls and carboxylic acids

What chemical tests can be carried out to qualitatively identify aldehydes and ketones?

What reactions can carboxylic acids undergo and how are they used to form esters?

Advanced organic synthesis

How can organic reactions be carried out to lengthen the continuous carbon chain?

What practical techniques are required to carry out filtration under reduced pressure and recrystallisation to form a solid product to have its melting point tested?

Exam preparation

How can I make sure I am revising effectively for this subject?
How do I memorise and recall knowledge I need for the exam?
How do I maximise marks in this subject's exam?
What are the gaps in my knowledge and how can I address them?
How do I approach exam questions in this subject to ensure I reach the highest grade?
What do I need to do to prepare myself for university courses?
What do I need to do to prepare myself for employment?