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**Pre-course Tasks:**

**Task 1:** Look at the new (2016) KS4 programmes of study for Chemistry. You will need to look at versions for both separate science (Chemistry) and the Chemistry component of the dual award GCSE. Make sure you understand what the different assessment objectives are and the role of the essential practicals. Have a look at the KS3 programme of study and be aware of the different ways in which schools are delivering KS3 (over 2 or 3 years) and KS4 (over 3 or 2 years) or as a 5 year continuum.

**Task 2**: Complete the two higher level specimen papers in black or blue ink. Then go back and annotate in green, any areas where you think the students may struggle – either because they have misconceptions or because they may misinterpret the question. If possible, give an indication of how you think students may struggle.

**Subject Knowledge Audit:**

Please complete the following table using the key below as guidance.

|  |  |
| --- | --- |
| 1 | Little or no secure knowledge. |
| 2 | Basic knowledge that would enable you to answer simple questions about the topic. |
| 3 | Secure knowledge that would allow you to explain the topic to others. |

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| --- | --- | --- | --- |
| **Area** | **Skill/knowledge** | **Level (1,2,3)** | **Evidence** |
| Atomic Structure & the Periodic Table. | * A simple model of the atom & the subatomic particles present. * The Periodic Table – specifically Groups 1, 7 & 0 and the transition metals. |  |  |
| Structure, bonding & properties of matter. | * States of matter & change in state in terms of particle kinetics & energy transfer. * Ionic, Covalent & metallic bonding. * Structure and bonding and how it links to properties. * Structure and bonding of Carbon. * Bulk & surface properties of matter including nanoparticles. |  |  |
| Chemical Changes | * Chemical symbols, formulae & equations. * Identification of common gases. * Reactions & reactivity of metals. * Properties and reactions of acids, including making salts. * Electrolysis. |  |  |
| Energy changes in chemical reactions | * Exothermic and endothermic reactions including reaction profiles. * Fuel cells & chemical cells. * Carbon compounds as fuels & feedstocks. |  |  |
| Rate & extent of chemical change | * Factors that affect the rate of reaction inc. catalysts. * Reversible reactions & dynamic equilibrium. |  |  |
| Organic Chemistry | * Homologous series inc. alkanes, alkenes, alcohols & carboxylic acids, reactions of alkanes, alkenes & alcohols. * Natural & man-made polymers – including addition and condensation polymers. |  |  |
| Chemical analysis | * Assessing purity & separating mixtures. * Law of conservation of mass & quantitative interpretation of balanced equations. * Use of amount of substance with respect to mass of pure substances. * Use of mole in relation to gas volume. * Determining the concentration of solution. * Identification of ions, by chemical or spectroscopic means. |  |  |
| Chemical & Allied industries | * Lifecycle assessment & recycling. * Fractional distillation & cracking. * Extraction & purification of metals based on reactivity. * Using materials. * The balance between equilibrium position & rate in industry. * Agricultural productivity & the use of NPK fertilisers. * Comparison of yield & atom economy of chemical reactions. |  |  |
| Earth & atmospheric science | * The evolution & composition of the atmosphere. * Greenhouse gases (Carbon dioxide & methane). * Common atmospheric pollutants & where they come from. * The Earth’s water resources & obtaining potable water. |  |  |

You should also identify which areas listed above are not included in the Dual award programme of study <https://www.gov.uk/government/publications/gcse-9-to-1-subject-level-conditions-and-requirements-for-combined-science>.

Make sure you understand the different assessment objectives including the weightings and that you know the role of the essential practicals.

**KS3 – Chemistry related content**

You need to know the following, so you have an appreciation of how ideas develop across the key stages. Indicate next to each part where it maps to in KS4.

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| **Area** | **Knowledge** | **KS4 Link** |
| The particulate nature of matter. | * The properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure. * Changes of state in terms of the particle model. |  |
| Atoms, elements & compounds. | * A simple (Dalton) atomic model. * Differences between atoms, elements and compounds. * Chemical symbols and formulae for elements and compounds. * Conservation of mass changes of state and chemical reactions. |  |
| Pure & impure substances. | * The concept of a pure substance. * Mixtures, including dissolving. * Diffusion in terms of the particle model. * Simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography. * The identification of pure substances. |  |
| Chemical reactions. | * Chemical reactions as the rearrangement of atoms. * Representing chemical reactions using formulae and using equations. * Combustion, thermal decomposition, oxidation and displacement reactions. * Defining acids and alkalis in terms of neutralisation reactions. * The pH scale for measuring acidity/ alkalinity; and indicators. * Reactions of acids with metals to produce a salt plus hydrogen. * Reactions of acids with alkalis to produce a salt plus water. * What catalysts do. |  |
| Energetics. | * Energy changes on changes of state (qualitative). * Exothermic and endothermic chemical reactions (qualitative). |  |
| The periodic table. | * The principles underpinning the Mendeleev periodic table. * The periodic table: periods and groups; metals and non-metals. * How patterns in reactions can be predicted with reference to the periodic table. * The properties of metals and non-metals. * The chemical properties of metal and non-metal oxides with respect to acidity. |  |
| Materials. | * The order of metals and carbon in the reactivity series. * The use of carbon in obtaining metals from metal oxides. * Properties of ceramics, polymers and composites (qualitative). |  |
| Earth & atmosphere. | * The composition of the Earth. * The structure of the Earth. * The rock cycle and the formation of igneous, sedimentary and metamorphic rocks. * Earth as a source of limited resources and the efficacy of recycling. * The composition of the atmosphere. * The production of carbon dioxide by human activity and the impact on climate. |  |

**Resources**

* Teach Now! Science - Tom Sherrington.
* Making Every Science Lesson Count - Shaun Allison.
* School Chemistry Experiments - Compiled by Ralph Farley for ASE.
* Making Sense of Secondary Science - Ros Driver, Ann Squires, Peter Rushworth.
* The Language of Measurement in Science (published by the ASE).
* (The language of Mathematics in Science - published by the ASE - you can get this free as a pdf).
* Science Learning Science Teaching (Third Edition) - Wellington, J & Ireson, G. 2012, Routledge.
* Teaching Secondary Science: Constructing Meaning and Developing Understanding (Third Edition) - Ross, K., Lakin, L. And McKechnie, J. 2012, Routledge.
* Learning to Teach Science on the Secondary School - Frost, J. 2010, Routledge.
* Teaching Secondary Chemistry (second edition) - Reiss. M 2012
* Teaching Secondary How Science Works - Kind, V 2008 Hodder/ASE.

Useful websites

[www.practicalchemistry.org](http://www.practicalchemistry.org/)

<http://www.chemguide.co.uk/>

<http://www.rsc.org/learn-chemistry/>

[www.teachitscience.co.uk](http://www.teachitscience.co.uk)

<http://www.schoolscience.co.uk/home>

[https://www.stem.org.uk/](https://www.stem.org.uk/" \t "_blank)