



# Advanced Higher Chemistry — draft Course Rationale and Summary



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# Course rationale

## Background

All new and revised National Courses reflect Curriculum for Excellence values, purposes and principles. They offer flexibility, provide more time for learning, more focus on skills and applying learning, and scope for personalisation and choice.

In this Course, and its component Units, there will be an emphasis on skills development and the application of those skills. Assessment approaches will be proportionate, fit for purpose and will promote best practice, enabling learners to achieve the highest standards they can.

This Course provides learners with opportunities to continue to acquire and develop the attributes and capabilities of the four capacities, as well as skills for learning, skills for life and skills for work.

All Courses provide opportunities for learners to develop breadth, challenge and application, but the focus and balance of the assessment will be appropriate for the subject area.

## **Relationship between the Course and Curriculum for Excellence values, purposes and principles**

Chemistry, the study of matter and its interactions, contributes essential knowledge and understanding across all aspects of our lives. Chemistry explains the links between the particulate nature of matter and the macroscopic properties of the world. Chemistry research and development is essential for the introduction of new products. The chemical industry is a major contributor to the economy of the country.

An experimental and investigative approach is used to develop knowledge and understanding of chemistry concepts.

The Course provides opportunities for learners to recognise the impact chemistry makes on developing sustainability, and its effects on the environment, on society and on the lives of themselves and others.

Chemistry Courses should encourage resilience, which leads to becoming a confident individual. Successful learners in chemistry think creatively, analyse and solve problems. Chemistry can produce responsible citizens through studying the impact it makes on developing sustainability and its effect on the environment, society, and the lives of themselves and others.

## **Purpose and aims of the Course**

The purpose of the Course is to develop learners' curiosity, interest and enthusiasm for chemistry in a range of contexts. The key skills of scientific inquiry and investigation are integrated and developed throughout the Course. The relevance of chemistry is highlighted by the study of the applications of chemistry in everyday contexts. This will enable learners to become scientifically literate citizens and be able to review science-based claims.

This Course will build on the knowledge, understanding and skills developed by the learner in the Higher Chemistry Course and will provide a useful bridge towards further study of Chemistry.

The aims of this Course are to enable learners to:

- ◆ develop a critical understanding of role of chemistry in scientific issues and relevant applications, including the impact these could make on society/the environment
- ◆ extend and apply knowledge, understanding and skills of chemistry
- ◆ develop and apply the skills to carryout complex practical scientific activities, including the use of risk assessments, technology, equipment and materials
- ◆ develop and apply scientific inquiry and investigative skills, including planning and experimental design

- ◆ develop and apply scientific analytical thinking skills, including scientific evaluation in a chemistry context
- ◆ extend and apply problem solving skills in a chemistry context
- ◆ develop an understanding of scientific literacy using a wide range of resources, in order to communicate complex ideas and issues and to make scientifically informed choices
- ◆ extend and apply skills of independent/autonomous working in chemistry

The Course provides well-mapped concept and skills development pathways. It also develops scientific understanding of issues relating to chemistry, and uses the development of chemical theory to build an extensive set of skills for learners. Through application of a detailed knowledge and understanding of chemical concepts, in practical situations, learners develop an appreciation of the impact of chemistry on their everyday lives. The Course gives opportunities for learners to develop the ability to think analytically, creatively and independently, and to make reasoned evaluations.

The Course also serves to equip all learners with an understanding of the impact of chemistry on everyday life, and with the knowledge and skills to be able to reflect critically on scientific and media reports. This allows learners to make their own reasoned decisions on many issues within a modern society where the body of scientific knowledge and its applications and implications are ever-developing.

By using the broad skills base and knowledge and understanding of detailed chemistry concepts, learners will become scientifically literate citizens.

The Course content has been selected to allow learners to study key chemical concepts within situations of personal relevance, using up-to-date contexts. Skills of scientific investigation, communication skills, literacy and numeracy are all developed within the Course. The Units offer opportunities for collaborative and independent learning, set within familiar and unfamiliar contexts and for high-quality experimental work.

## **Information about typical learners who might do the Course**

This Course is designed for all learners who want to challenge themselves by learning Chemistry at a higher level and especially those considering further study or a career in Chemistry and related disciplines. It takes account of the needs of all learners, and provides sufficient flexibility to enable learners to achieve in different ways.

This Course is suitable for learners who are secure in their learning of Higher Chemistry or an equivalent qualification. This Course emphasises practical and experiential learning opportunities, with a strong skills-based approach to learning.

This Course will allow opportunities for learners to develop chemical knowledge and scientific skills that directly relate to everyday life. On completing this Course,

learners will have developed analytical thinking skills, inquiry and investigative skills, problem solving skills and practical skills.

Advanced Higher Chemistry encourages independent learning and allows learners to make connections between science and the world in which they live, learn and work. Learners will develop transferable skills and be better prepared for future study and/or employment. Literacy is developed as this Course encourages wider reading and learners will have the ability to communicate scientific ideas and opinions in a coherent, logical manner. Due to the interdisciplinary nature of the sciences, learners taking this Course along with the other science subjects will enhance their skills, knowledge and understanding.

On successful completion of this Course, learners could progress to:

- ◆ HND/degree programmes in a chemistry-based course or a related area such as medicine, dentistry, veterinary medicine, engineering, professions allied to medicine, law
- ◆ careers in a chemistry-based discipline or related area or a wide range of other areas such as management, civil service, education business, commerce and industry

# Course summary

**Course title: Advanced Higher Chemistry**

**SCQF level 7 (32 SCQF credit points)**

## Course outline

### Mandatory Units

The Course comprises the following mandatory Units:

**Researching Chemistry (Advanced Higher) 8 SCQF credit points**

**Inorganic and Physical Chemistry (Advanced Higher) 8 SCQF credit points**

**Organic Chemistry and Instrumental Analysis (Advanced Higher) 8 SCQF credit points**

**Course assessment 8 SCQF credit points**

This Course includes eight SCQF credit points to allow additional time for preparation for Course assessment. The Course assessment covers the added value of the Course. Further information on the Course assessment is provided in the Assessment section.

# Course structure and conditions of award

## Course structure

The Course is practical and experiential, developing skills in a chemical context. Through a variety of real-life contexts, learners will acquire and apply knowledge and understanding of chemical concepts and develop this through an application-led approach including practical activities.

By completing this Course, learners will develop important and relevant skills, attitudes and attributes related to chemistry, including: developing scientific and analytical thinking skills in a chemistry context; developing an understanding of chemistry's role in scientific issues; and acquiring and applying knowledge and understanding of chemistry concepts.

Learners will also develop understanding of how chemical products are formed, and of relevant applications of chemistry in society.

As well as developing specific scientific skills, in areas such as experimentation and investigation, learners will also gain valuable transferable skills for learning, life and work, such as literacy, numeracy and citizenship.

Advanced Higher Chemistry will extend learners' understanding of chemical concepts through a contextual and application-led process, where the importance of continual research and the concepts of sustainability are highlighted.

Units are statements of standards for assessment and not programmes of learning and teaching. They can be delivered in a number of ways.

### **Researching Chemistry (Advanced Higher)**

In this Unit, learners will be given the opportunity to gain an understanding of stoichiometric calculations, to develop practical skills and to carry out research in chemistry. Learners will develop the key skills associated with a variety of different practical techniques including the related calculations. Equipped with the knowledge of chemistry apparatus, techniques and an understanding of concepts, learners will identify, research, plan and carry out safely a chemistry practical investigation of their choice. The Unit will equip learners with the scientific background and skills necessary to analyse scientific articles and use them in order to make informed choices and decisions.

### **Inorganic and Physical Chemistry (Advanced Higher)**

This Unit develops a knowledge and understanding of the principles and concepts of inorganic and physical chemistry.

Learners will discover how electromagnetic radiation is used in atomic spectroscopy to identify elements. They will develop a deeper understanding of the concept of atomic structure by considering atomic orbitals and electronic

configuration related to the periodic table. Using electron pair theory learners will predict the shape of molecules. Learners will gain an understanding of the physical and chemical properties of transition metals and their compounds.

Learners will investigate the quantitative component of chemical equilibrium.

Learners will develop their understanding of the factors which influence the feasibility of chemical reactions. They will progress their understanding of reaction kinetics by exploring the order and mechanisms of chemical reaction.

### **Organic Chemistry and Instrumental Analysis (Advanced Higher)**

This Unit develops a knowledge and understanding of organic chemistry. Learners will research the structure of organic compounds, including aromatics and amines, and draw on this to explain the physical and chemical properties of the compounds.

They will consider the key organic reaction types and mechanisms and link these to the synthesis of organic chemicals. Learners will discover the origin of colour in organic compounds and how elemental analysis and spectroscopic techniques are used to verify chemical structure. They will study the use of medicines in conjunction with the interactions of the drugs.

## **Conditions of award**

To gain the award of the Course, the learner must pass all of the Units as well as the Course assessment. The required Units are shown in the Course outline section. Course assessment will provide the basis for grading attainment in the Course award.

# Assessment

Information about assessment standards for the Course is included in the *Course Assessment Specification*, which provides full details including advice on how a learner's overall attainment for the Course will be determined.

## Unit assessment

All Units are internally assessed against the requirements shown in Unit specifications.

They can be assessed on a Unit-by-Unit basis or by combined assessment.

They will be assessed on a pass/fail basis within centres. SQA will provide rigorous external quality assurance, including external verification, to ensure assessment judgements are consistent and meet national standards.

Exemplification of possible assessment approaches for these Units will be provided in the *National Assessment Resource*.

## Course assessment

Courses from National 4 to Advanced Higher include assessment of [added value](#)<sup>1</sup>. At National 5, Higher and Advanced Higher, the added value will be assessed in the Course assessment. The added value for the Course must address the key purposes and aims of the Course, as defined in the Course Rationale. It will do this by addressing one or more of breadth, challenge and application.

In the Advanced Higher Chemistry Course, added value will focus on:

- ◆ challenge
- ◆ application

Learners will draw on, extend and apply the skills they have learned during the Course. This will be assessed within a [question paper](#)<sup>2</sup> and a [project](#)<sup>3</sup>, requiring demonstration of knowledge, skills and understanding acquired from across the Units and how they can be applied in unfamiliar contexts and/or integrated ways.

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<sup>1</sup> Definitions can be found here: [www.sqa.org.uk/sqa/45528.html](http://www.sqa.org.uk/sqa/45528.html)

<sup>2</sup> See link above for definitions.

<sup>3</sup> See link above for definitions.