ADVANCED HIGHER CHEMISTRY

**Recommended entry**

Learners are expected to have attained the skills, knowledge and understanding required by Higher Chemistry.

**Purpose and aims of the Course**

The purpose of the Advanced Higher Chemistry Course is to develop learners’ knowledge and understanding of the physical and natural environments beyond Higher level. The Course builds on Higher Chemistry, continuing to develop the underlying theories of chemistry and the practical skills used in the chemistry laboratory. The Course also develops the skills of independent study and thought that are essential in a wide range of occupations.

The Course 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 publications and media reports concerning chemistry. By using the broad skills base and knowledge and understanding of detailed chemistry key areas, learners will become scientifically literate citizens and be able to review the science-based claims they will meet and to communicate in an evidence-based manner. This also allows learners to make their own reasoned decisions on many issues within a modern society increasingly dependent on chemistry, science and technology.

The relevance of chemistry is highlighted by the study of the applications of chemistry in everyday contexts. The purpose of the Course is to build on the knowledge, understanding and skills developed by the learner in Higher Chemistry and to provide a useful bridge towards further study of chemistry.

The Advanced Higher Chemistry Course aims to enable learners to:

* Develop a critical understanding of the role of chemistry in scientific issues and relevant applications, including the impact these could make on the environment/society
* Extend and apply knowledge, understanding and skills of chemistry
* Develop and apply the skills to carry out 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 analytical thinking skills, including critical evaluation of experimental procedures in a chemistry context
* Extend and apply problem solving skills in a chemistry context
* Further 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 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. Learners’ creativity will be developed and encouraged through opportunities to generate new ideas when planning and designing investigations and experiments, which they will carry out.

The key skills of scientific inquiry and investigation are integrated and developed throughout the Course. The Units offer opportunities for collaborative and independent learning, set within familiar and unfamiliar contexts.

Practical investigative skills are particularly important at this level. This is reflected in the opportunity to carry out high-quality experimental work within all the Course Units and particularly in the Advanced Higher *Researching Chemistry* Unit, which incorporates both practical techniques and skills of scientific investigation.

This 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 Course is designed for all learners who can respond to a level of challenge, especially those considering further study or a career in chemistry and related disciplines.

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

Advanced Higher Chemistry will allow opportunities for learners to develop chemical knowledge and skills that directly relate to real situations. On completing the Course, learners will have developed analytical thinking skills, inquiry and investigative skills, and problem solving and practical skills.

Literacy is developed, as reading and interpreting scientific literature is encouraged. Learners will be given opportunities to develop scientific ideas and opinions in a coherent logical manner.

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. Due to the interdisciplinary nature of the sciences, learners taking this Course along with other science subjects will enhance their skills, knowledge and understanding.

**PROGRESSION**

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, law, dentistry, veterinary medicine, engineering, environmental and health sciences
* Careers in a chemistry-based discipline or related area, or in a wide range of other areas, such as oil and gas exploration, renewable energy development, engineering, technology, pharmaceuticals, environmental monitoring, forensics, research and development, management, civil service and education

As well as providing an excellent grounding for the future study of chemistry and chemistry-related subjects, the Course also equips all learners with an understanding of the positive impact of chemistry on everyday life.

Other learners may choose this Course because they have a particular interest in the subject and wish to take the opportunity of studying it in depth.

**Course structure and conditions of award**

**Course structure**

*Inorganic and Physical Chemistry*

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

*Organic Chemistry and Instrumental Analysis*

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.

*Researching Chemistry*

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 safely carry out 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.

Skills, knowledge and understanding

These include:

* Extending and applying knowledge of chemistry to new situations, interpreting and analysing information to solve complex problems
* Planning and designing chemical experiments/investigations, using reference material and including risk assessments, to test a hypothesis or to illustrate particular effects
* Carrying out complex experiments in chemistry safely, recording systematic detailed observations and collecting data
* Selecting information from a variety of sources and presenting detailed information appropriately, in a variety of forms
* Processing and analysing chemical information/data (using calculations, significant figures and units, where appropriate)
* Making reasoned predictions and generalisations from a range of evidence/information
* Drawing valid conclusions and giving explanations supported by evidence/justification
* Critically evaluating experimental procedures by identifying sources of uncertainty, suggesting and implementing improvements
* Drawing on knowledge and understanding
* Understanding of chemistry to make accurate statements, describe complex information, provide detailed explanations and integrate knowledge
* Communicating chemical findings/information fully and effectively
* Analysing and evaluating scientific publications and media reports

**Course assessment**

1. Written Exam : 2 hours, 100 marks
2. Project; 30 marks