



Higher  
Course Assessment  
Specification



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# Higher Chemistry Course Assessment Specification (C713 76)

**Valid from August 2014**

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Please refer to the note of changes at the end of this Course Assessment Specification for details of changes from previous version (where applicable).

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## Course outline

<b>Course title:</b>	Higher Chemistry
<b>SCQF level:</b>	6 (24 SCQF credit points)
<b>Course code:</b>	C713 76
<b>Course assessment code:</b>	X713 76

The purpose of the Course Assessment Specification is to ensure consistent and transparent assessment year on year. It describes the structure of the Course assessment and the mandatory skills, knowledge and understanding that will be assessed.

### Course assessment structure

Component 1 — question paper	100 marks
Component 2 — assignment	20 marks
<b>Total marks</b>	<b>120 marks</b>

This Course includes six SCQF credit points to allow additional time for preparation for Course assessment. The Course assessment covers the added value of the Course.

### Equality and inclusion

This Course Assessment Specification has been designed to ensure that there are no unnecessary barriers to assessment. Assessments have been designed to promote equal opportunities while maintaining the integrity of the qualification.

For guidance on assessment arrangements for disabled learners and/or those with additional support needs, please follow the link to the Assessment Arrangements web page: [www.sqa.org.uk/sqa/14977.html](http://www.sqa.org.uk/sqa/14977.html).

Guidance on inclusive approaches to delivery and assessment of this Course is provided in the *Course Support Notes*.

# Assessment

To gain the award of the Course, the learner must pass all of the Units as well as the Course assessment. Course assessment will provide the basis for grading attainment in the Course award.

## Course assessment

SQA will produce and give instructions for the production and conduct of Course assessments based on the information provided in this document.

## Added value

The purpose of the Course assessment is to assess added value of the Course as well as confirming attainment in the Course and providing a grade. The added value for the Course will 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, or application.

In this Course assessment, added value will focus on the following:

- ◆ breadth — drawing on knowledge and skills from across the Course
- ◆ challenge — requiring greater depth or extension of knowledge and/or skills
- ◆ application — requiring application of knowledge and/or skills in practical or theoretical contexts as appropriate

This added value consists of:

- ◆ a question paper, which requires learners to demonstrate aspects of breadth, challenge and application; learners will apply breadth and depth of skills, knowledge and understanding from across the Course to answer questions in chemistry
- ◆ an assignment, which requires learners to demonstrate aspects of challenge and application; learners will apply skills of scientific inquiry, using related knowledge, to carry out a meaningful and appropriately challenging task in chemistry and communicate findings

## Grading

Course assessment will provide the basis for grading attainment in the Course award.

The Course assessment is graded A–D. The grade is determined on the basis of the total mark for all Course assessments together.

A learner's overall grade will be determined by their performance across the Course assessment.

**Grade description for C**

For the award of Grade C, learners will have demonstrated successful performance in all of the Units of the Course. In the Course assessment, learners will typically have demonstrated successful performance in relation to the mandatory skills, knowledge and understanding for the Course.

**Grade description for A**

For the award of Grade A, learners will have demonstrated successful performance in all of the Units of the Course. In the Course assessment, learners will typically have demonstrated a consistently high level of performance in relation to the mandatory skills, knowledge and understanding for the Course.

In addition, learners achieving a Grade A will have demonstrated a high overall level of performance by:

- ◆ retaining knowledge and understanding over a long period of time
- ◆ showing a deeper level of knowledge and understanding
- ◆ integrating and applying skills, knowledge and understanding across the three component Units of the Course
- ◆ displaying problem solving skills in less familiar and more complex contexts
- ◆ applying skills of scientific inquiry and analytical thinking in complex contexts that involve more complex data

**Credit**

To take account of the extended range of learning and teaching approaches, remediation, consolidation of learning and integration needed for preparation for external assessment, six SCQF credit points are available in Courses at National 5 and Higher, and eight SCQF credit points in Courses at Advanced Higher. These points will be awarded when a grade D or better is achieved.

## Structure and coverage of the Course assessment

The Course assessment will consist of two Components: a question paper and an assignment. The question paper will have two Sections. The assignment will have one Section.

### Component 1 — question paper

The purpose of the question paper is to assess breadth and depth of knowledge and understanding from across the Units.

The paper will assess scientific inquiry skills, analytical thinking skills and the impact of applications on society and the environment.

The question paper will give learners an opportunity to demonstrate the following skills, knowledge and understanding by:

- ◆ demonstrating knowledge and understanding of chemistry by making statements, describing information, providing explanations and integrating knowledge
- ◆ applying chemistry knowledge to new situations, analysing information and solving problems
- ◆ planning and designing experiments/practical investigations to test given hypotheses or to illustrate particular effects including safety measures.
- ◆ selecting information and presenting information appropriately in a variety of forms
- ◆ processing information (using calculations and units, where appropriate)
- ◆ making predictions and generalisations from evidence/information
- ◆ drawing valid conclusions and giving explanations supported by evidence/justification
- ◆ evaluating experiments/practical investigations and suggesting improvements

The mandatory skills and knowledge are specified in the 'Further mandatory information on Course coverage' section at the end of this Course Assessment Specification.

The question paper will have 100 marks

The question paper will have two Sections.

**Section 1** (Objective Test) will have 20 marks.

**Section 2** will contain restricted and extended response questions and will have 80 marks.

Marks will be distributed approximately proportionately across the Units.

The majority of the marks will be awarded for applying knowledge and understanding. The other marks will be awarded for applying scientific inquiry, scientific analytical thinking and problem solving skills.

A data booklet containing relevant data and formulae will be provided.

## Component 2 — assignment

This assignment requires learners to apply skills, knowledge and understanding to investigate a relevant topic in chemistry. The topic should draw on one or more of the key areas of the Course, and should be chosen with guidance from the assessor.

The assignment will assess the application of skills of scientific inquiry and related chemistry knowledge and understanding.

The assignment will give learners an opportunity to demonstrate the following skills, knowledge and understanding by:

- ◆ applying chemistry knowledge to new situations, analysing information and solving problems
- ◆ selecting information and presenting information appropriately in a variety of forms
- ◆ processing the information (using calculations and units, where appropriate)
- ◆ drawing valid conclusions and giving explanations supported by evidence/justification
- ◆ communicating findings/information effectively

The assignment will have 20 marks out of a total of 120 marks.

The majority of the marks will be awarded for applying scientific inquiry and analytical thinking skills. The other marks will be awarded for applying knowledge and understanding related to the topic chosen.

The assignment offers challenge by requiring skills, knowledge and understanding to be applied in a context that is one or more of the following:

- ◆ unfamiliar
- ◆ familiar but investigated in greater depth
- ◆ integrates a number of familiar contexts

This assignment has two stages:

- ◆ a research stage
- ◆ a communication stage

In the course of their assignment, learners are required to:

- ◆ choose a relevant topic in chemistry (the assessor must review the appropriateness of the topic chosen)
- ◆ state appropriate aim (s)
- ◆ research the topic by selecting relevant data/information
- ◆ risk assessment of procedure
- ◆ process and present relevant data/information
- ◆ analyse data/information
- ◆ state conclusions
- ◆ evaluate their investigation
- ◆ explain the underlying chemistry of the topic researched
- ◆ present the findings of the research in a report

## Setting, conducting and marking of assessment

### Question paper

This question paper will be set and marked by SQA, and conducted in centres under conditions specified for external examinations by SQA. Learners will complete this in 2 hours and 30 minutes.

### Controlled assessment — assignment

This assignment is:

- ◆ set by centres within SQA guidelines
- ◆ conducted under a high degree of supervision and control

Evidence will be submitted to SQA for external marking.

All marking will be quality assured by SQA.

### Setting the assessment

Set by centres within SQA guidelines.

### Conducting the assessment

The **research** stage will be conducted under some supervision and control.

The **communication** stage will be conducted under a high degree of supervision.

SQA will provide Assignment General assessment information and Assignment Assessment task documents. SQA will specify the material to be taken into the communication stage of the assignment.

The production of the report will be carried out:

- ◆ in time to meet a submission date set by SQA
- ◆ independently by the learner

## Further mandatory information on Course coverage

The following gives details of mandatory skills, knowledge and understanding for the Higher Chemistry Course. Course assessment will involve sampling the skills, knowledge and understanding. This list of skills, knowledge and understanding also provides the basis for the assessment of Units of the Course.

The following gives details of the skills:

- ◆ demonstrating knowledge and understanding of chemistry by making statements, describing information, providing explanations and integrating knowledge
- ◆ applying chemistry knowledge to new situations, analysing information and solving problems
- ◆ planning and designing experiments/practical investigations to test given hypotheses or to illustrate particular effects including safety measures.
- ◆ carrying out experiments/practical investigation safely, recording detailed observations and collecting data
- ◆ selecting information and presenting information appropriately in a variety of forms
- ◆ processing information (using calculations and units, where appropriate)
- ◆ making predictions and generalisations from evidence/information
- ◆ drawing valid conclusions and giving explanations supported by evidence/justification
- ◆ evaluating experiments/practical investigations and suggesting improvements
- ◆ communicating findings/information effectively

These skills will be assessed, across the Course, in the context of the mandatory knowledge. The following table provides further detail of the mandatory knowledge for the Higher Chemistry Course.

<b>Chemical Changes and Structure</b>
<b>Controlling the rate</b> <ul style="list-style-type: none"><li>◆ Collision theory, explaining changing rates of reaction and activation energy. Relative rate of reaction</li><li>◆ Reaction profiles — potential energy diagrams, energy pathways, activated complex, activation energy and enthalpy changes</li><li>◆ Catalysts — reaction pathway, activation energy</li><li>◆ Energy distribution diagrams showing effect of temperature changes on successful collisions. The effect of temperature on the reaction rate in terms of kinetic energy of particles</li></ul>
<b>Periodicity</b> <ul style="list-style-type: none"><li>◆ Periodic Table — the first 20 elements in the Periodic Table are categorised according to their bonding and structure. Periodic trends and underlying patterns and principles</li><li>◆ Covalent radius, ionisation energy, electronegativity and trends in groups and periods, related to atomic structure</li></ul>
<b>Structure and bonding</b> <ul style="list-style-type: none"><li>◆ Bonding continuum</li><li>◆ Polar covalent bonds and their position on the bonding continuum, dipole formation and notation <math>\delta^+ \delta^-</math>, eg <math>\text{H} \delta^+ \text{—Cl} \delta^-</math></li><li>◆ Intermolecular forces, called vdW forces, London dispersion forces, permanent</li></ul>

dipole-dipole forces, hydrogen bonding and their relative strengths and the resulting effects on the physical properties of substances, including solubility

## Nature's Chemistry

### Esters, fats and oils

- ◆ Esters — naming, structural formulae and uses
- ◆ Fats and oils as a source of energy
- ◆ Fats and oils, esters condensation and hydrolysis reactions
- ◆ Saturated and unsaturated fats and oils
- ◆ Melting points of oils and fats, through intermolecular bonding

### Proteins

- ◆ Enzymes as biological catalysts, amino acids, dietary proteins, condensation reactions to make proteins and amide link, peptide link
- ◆ Digestion, enzyme hydrolysis of dietary proteins.

### Chemistry of cooking

For compounds with no more than eight carbon atoms in their longest chain.

- ◆ Flavours in foods. Influence of functional groups on solubility, boiling points and volatility
- ◆ Aldehydes as sources of flavour and aroma
- ◆ For aldehydes and ketones: carbonyl functional group, structural formulae, molecular formulae, systematic names and isomers. Oxidation reactions of aldehydes and ketones
- ◆ Effect of heat on proteins, denature of proteins

### Oxidation of food

For compounds with no more than eight carbon atoms in their longest chain.

Alcohols

- ◆ For branch chained alcohols systematic names, structural formulae and isomers.
- ◆ Hydrogen bonding. Diol, triols and the effect of hydrogen bonding on properties of these molecules
- ◆ Primary, secondary and tertiary alcohols, oxidation reactions and products, oxidising agents

Carboxylic acids

- ◆ For branch chained carboxylic acids systematic names, structural formulae and isomers.
- ◆ Reactions of carboxylic acids to include reduction and reactions with bases to form salts.

Reaction of oxygen with edible oils

- ◆ Antioxidants. Ion-electron equations for the oxidation of antioxidants

### Soaps, detergents and emulsions

- ◆ Hydrolysis of esters. Structure of soap ions including covalent tail, (hydrophobic), and an ionic head (hydrophilic), cleansing action of soaps
- ◆ Production, action and use of detergents
- ◆ Emulsion and emulsifiers and their formation and use in food

### Fragrances

- ◆ Essential oils from plants, properties, uses and products

- ◆ Terpenes functional group, structure and use. Oxidation of terpenes within plants

**Skin care**

- ◆ The damaging effect of ultraviolet radiation (UV) in sunlight on skin and the action of sun-block. Formation of free radicals in UV light
- ◆ Structure, reactivity and reactions of free radicals
- ◆ Free radical scavengers in cosmetic products, food products and plastics. Reaction of free radical scavengers with free radicals to prevent chain reactions

## Chemistry in Society

### Getting the most from reactants

- ◆ Availability, sustainability and cost of feedstock(s); opportunities for recycling; energy requirements; marketability of by-products; product yield
- ◆ Balanced equations
- ◆ Mole ratio(s) of reactants and products
- ◆ Determination of quantities of reactants and/or products using balanced equation, the gram formula masses (GFM), mass and moles
- ◆ Determination of quantities of reactants and/or products using balanced equations, concentrations and volumes of solutions and/or masses of solutes
- ◆ Calculations of mass or volume (for gases) of products, assuming complete conversion of reactants.
- ◆ Percentage yield and atom economy
- ◆ Limiting reactants and excesses identified

### Equilibria

- ◆ Reversible reactions, dynamic equilibrium, altering equilibrium position, effect of catalyst on equilibrium and the most favourable reaction conditions

### Chemical energies

- ◆ Enthalpy calculations used for industrial processes
- ◆ The specific heat capacity, mass temperature and moles used to calculate the enthalpy change for a reaction
- ◆ Enthalpies of combustion
- ◆ Hess's law, calculation of enthalpy changes by application of Hess's law
- ◆ Bond enthalpies — the molar bond enthalpy and mean molar bond enthalpies for molecules
- ◆ Enthalpy changes for gas phase reactions can be calculated using bond enthalpies

### Oxidising or reducing agents

- ◆ Elements, molecules, group ions and compounds as oxidising and reducing agents
- ◆ Electrochemical series as reduction reactions
- ◆ Uses of oxidising agents
- ◆ Ion-electron equations for redox, oxidation and reduction processes

### Chemical analysis

- ◆ Uses of chromatography. Differences in the polarity and/or size of molecules
- ◆ Volumetric titrations, volumetric analysis for quantitative reactions. Standard solutions, acid base and redox titrations

## Researching Unit

Candidates should have knowledge of the following pieces of general laboratory apparatus:

- ◆ Conical flask
- ◆ Beaker
- ◆ Measuring cylinder
- ◆ Delivery tubes

- ◆ Dropper
- ◆ Test tubes/Boiling tubes
- ◆ Evaporating basin
- ◆ Pipette with safety filler
- ◆ Burette
- ◆ Volumetric flask
- ◆ Funnel
- ◆ Thermometer

Candidates should be familiar with the following techniques

- ◆ Filtration
- ◆ Distillation
- ◆ Use of a balance
- ◆ Titration
- ◆ Methods for the collection of a gas: over water, using a gas syringe
- ◆ Safe Methods for heating: Bunsen burners, water baths or heating mantles

## Administrative information

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### History of changes to Course Assessment Specification

Course details	Version	Description of change	Authorised by	Date
	2.0	<p>Page 2 – the number of marks awarded for the assignment has changed.</p> <p>Pages 5 and 6 – the descriptions of the skills to be assessed have been rewritten to better explain what is required.</p> <p>Page 7 – Conducting the assessment: this has been rewritten to clarify how stages will be assessed. Suggested timings for each stage have been removed.</p> <p>Page 8 –the details of the skills to be assessed have been rewritten for clarity</p> <p>Page 8 onwards – Further mandatory knowledge: these tables have been substantially revised to aid understanding</p>	Qualifications Development Manager	April 2014

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Note: You are advised to check SQA's website ([www.sqa.org.uk](http://www.sqa.org.uk)) to ensure you are using the most up-to-date version of the Course Assessment Specification.

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