



ARRANGEMENTS

HNC Applied Sciences (G7V9 15)

Validated: April 2005

Version: 06 (March 2014)

HNC APPLIED SCIENCES
VALIDATED — APRIL 2005

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1 Introduction

This is the arrangements document for the revised Group Award: HNC Applied Sciences and the associated Graded Unit. The HN Units that make up the Group Award have been validated separately in accordance with the new design principles.

The arrangements document has been developed in order to assist centres in preparing for approval for the new HNC Applied Sciences Group Award and maintaining the award following successful approval. This award was validated in April 2005 and replaces the existing first year of a number of HND science awards (see 2.1 below) as well as being an award in its own right.

This document includes details on the background to the development of the new award, its aims (both general and specific), recommended access requirements, information about the structure of the award, recommendations on delivery and assessment and guidance for centres.

2 Rationale

2.1 Reason for the review of the HNC Applied Sciences Award

It was agreed by centres at a National Conference in 2004 that it was desirable to have a National Award at HNC level which could articulate to the majority of the science HNDs. Development Teams were subsequently formed to work on each of the HND awards. It was also agreed to use the existing HNC Applied Sciences (2004 version) as the starting point for the common HNDs. It was proposed that the development teams would aim to create a generic, broad-based HNC Applied Sciences as suggested at the February 2004 conference. It was envisaged that this smaller core could be used as an exit award for the following HND Science awards:

- ◆ Applied Science
- ◆ Applied Biological Sciences
- ◆ Biomedical Science
- ◆ Chemistry
- ◆ Environmental Science
- ◆ Biotechnology

The review has provided an opportunity for inclusion of updated technical content, revised assessment strategies, flexibility to match current employment needs and more appropriate recognition of the needs of candidates for progression to Higher Education.

2.2 Consultation Process

Extensive consultation was carried out at all stages of the review process to ascertain both the level of uptake of the awards as well as the relevance of the framework and units to form the basis for the first year of the six HNDs.

This consultation involved:

- ◆ Colleges
- ◆ Employers
- ◆ Candidates
- ◆ Higher education institutions to which successful candidates could articulate

In reviewing this award, consultations were undertaken at key stages in the development schedule. Development teams and the Team leaders of each group helped to guide the overall development process.

Stakeholder	Method of Consultation
Employers	<ul style="list-style-type: none"> ◆ Questionnaire sent to employers (information gathered on the award content and structure) ◆ Face to face interviews and telephone questionnaires
Higher Education	<ul style="list-style-type: none"> ◆ Questionnaires ◆ Face to face interviews
Centres	<ul style="list-style-type: none"> ◆ All delivering centres invited onto development teams ◆ Postal questionnaire sent to all centres ◆ Conferences held in January 2003 and January 2004 to update and inform centres ◆ Information updates posted on SQA website — HN Science pages
Candidates	<ul style="list-style-type: none"> ◆ Questionnaires given to existing candidates to gauge what changes, if any, students would like to see being made to the HNC

2.2.1 Feedback of Consultation

The consultation confirmed that there was considerable demand for the proposed award from Colleges, candidates, employers and Higher Education Institutions. Through consultation, a number of changes were made to the framework. Taking into account the planned review of all HN Science programmes it was felt that one HNC Applied Sciences framework which would be flexible and able to be used as a first year for a number of science HND frameworks was the preferred option.

2.2.2 Demand for Revised Course

During consultation at the HN Science conference in January 2003, it was recognised that the review process should streamline units and courses to create a number of HND Science programmes, the majority of which would have a common HNC/HND first year. This was endorsed at the 2004 conference after which development teams were set up to develop the six revised HND programmes.

As a result of the findings, this new framework was designed which met the needs of all stakeholders. The new framework reflects the new design principles of 12 credits for the HNC Applied Sciences Group Award and 30 credits for the HND Group Award.

The need for the HNC/D Group Awards has been clearly identified. These Group Awards contribute to an overall strategy for reducing the skills gap in the Science industry and enhancing the Scottish economy by further expansion of science knowledge.

3 Aims of the Qualification

3.1 General aims

The overall aim is to provide a progressive, integrated and coherent qualification which will be responsive to the needs of candidates and employers. Specifically these are to:

- ◆ **Develop candidates' knowledge and skills** such as planning, analysis and synthesising in the area of Applied Sciences.
Develop employment skills and enhance candidates employment prospects by providing the candidate with a wide range of practical laboratory skills.
- ◆ **Facilitate students' access to HE.**
- ◆ **Introduce students to a broader view of science.**
- ◆ **Enable progression** within SCQF.
- ◆ **Develop study and research skills** in the area of Science.
- ◆ **Develop transferable skills** including Core Skills.
- ◆ **Provide a stimulating and intellectually satisfying learning experience.** The level and content of knowledge necessary for successful completion of this award will require diligence and commitment from the candidate. The structure of the award, design of the assessment and the relationship between theory and observed good practice are intended to provide a balance between presented learning and developmental thinking on the part of the candidate.

3.2 Specific Aims of the Award

The specific aims of the HNC Applied Sciences are to:

- ◆ **Prepare candidates for an appropriate level of employment**, in science areas such as research and industrial laboratories; biotechnology, biological, biomedical, chemical, microbiological, pharmaceutical, and environmental industries.
- ◆ **Develop a range of contemporary vocational skills** relating to the use, support and development of systems appropriate to employment at technician or professional level.
- ◆ **Develop options to permit an element of vocational specialisation** in a variety of science areas such as; biotechnological, chemical, therapeutics, diagnostics, agriculture, veterinary and environmental.
- ◆ **Prepare candidates for progression to further studies** in science related disciplines.
- ◆ **Provide a flexible route to a qualification**, meeting demand, for example, for those already in employment. The unitised structure of the course and the intended modes of delivery will provide access to this qualification from those in employment through part-time provision and for direct entry or seconded candidates through full-time provision. Discrete units will be available for study.
- ◆ **Give students the opportunity to discover** which areas of science most interest them by giving them a tease of each of the main branches. This is particularly important for younger candidates or those coming from a background with little contact with science.

3.3 Target Audience

The award is designed for those who wish to take up a career in the science-based industries including:

- ◆ students articulating from the suite of National Certificate programmes
- ◆ students articulating from ACCESS courses
- ◆ school leavers with a minimum of one Science Higher at C grade
- ◆ students who may have partially completed one or two years of a degree programme

The HNC Applied Sciences Group award is a general science award which allows candidates to gain skills and knowledge in the general and biological sciences and core skills by providing them with an exposure to each of the main branches of science and allow them to progress to more specialised branches of science (see 6.1).

The award is designed for both full and part-time candidates.

The award may be delivered by open and distance learning methods, provided that adequate preparations are made. Additional planning and resources will be needed for candidate support, assessment and laboratory work.

In respect of assessment, a combination of new and traditional authentication tools and techniques may have to be devised. Quality assurance procedures must also be sufficient and robust to support open and distance learning. Further advice and guidance is available in the SQA publication *Assessment and Quality Assurance for Open and Distance Learning* — SQA February 2001.

3.4 Progression Routes

In designing the award, the Development Group has been fully aware of the need for the qualifications to contain relevant technical and transferable skills to enable immediate entry to employment while at the same time allowing articulation to degree courses. The Development Group believes that an appropriate balance between academic and vocational knowledge and skills has been achieved through the mix of unit content and teaching approaches.

Care has been taken in the design of the curriculum of these awards to ensure that topics and units required to maintain articulation routes are included. Thus no difficulty is foreseen in maintaining existing articulation routes.

3.5 Title of the Group Award

The award title “HNC Applied Sciences” reflects the broad nature of the award and the flexibility of the award. The HNC gives candidates an understanding of all areas of Science and allows them to specialise in a chosen area if progressing to a specific HND.

3.6 The Scottish Credit and Qualifications Framework

Due cognisance has been taken of the requirements of the Scottish Credit and Qualifications Framework (SCQF) during the design of these awards. This means that the HNC Applied Sciences award is at SCQF level 7.

3.7 Employment Opportunities

The employment prospects for holders of the HNC are excellent. For example *Futureskills Scotland* published jointly by Highlands and Islands enterprise and Scottish Enterprise make labour market projections for the years 2003–2008. These predictions are based on an economic forecasting model produced by the researchers at the universities of Warwick and Cambridge. This model forecasts that within Scotland, in the periods covered, there

- ◆ will be 500,000 new jobs arising of which:
 - 103,000 will be in health and education
 - 5,000 will be in chemicals
 - 8,000 will be in manufacturing
 - 5,000 will be in the food, drink and tobacco industries and
- ◆ that 56% of these new jobs will require a qualification at HNC or above.

This programme has been designed to meet the needs of this expanding employment market and candidates will develop the competences required to enhance their ability to obtain employment as a senior technician, junior laboratory manager or production process controller in Science based industries.

4 Recommended conditions for entry to the Qualifications (Access)

4.1 Formal Qualifications

It is intended that admission to these awards should be as broadly based as possible, but that this should be consistent with the selection of candidates who have a reasonable chance of successfully completing the award(s). The following entry requirements are given as guidelines only:

- ◆ One Science Higher and not fewer than three Standard Grade 3 passes, including Chemistry, Biology, Biotechnology or Human Biology and Mathematics.
- ◆ National Qualification in an appropriate Science and Maths programme, such as Access to Science. Candidates should preferably possess some units at Higher level.
- ◆ Scottish Group Award (SGA) in Science at Intermediate 2.
- ◆ Qualification comparable to the above, gained through other awarding bodies, such as GCSE, City and Guilds, Edexcel.
- ◆ At the discretion of the Principal of the presenting centre for applicants with a different experiential background, who could benefit from taking the course or units within the course, eg adult returners, overseas candidates.

4.2 Alternative access arrangements

The presenting centre may operate alternative access arrangements in cases where the candidate is convinced s/he already has the required competences in a given area. These arrangements are as follows:

- ◆ Assessment on demand.
- ◆ Credit transfer.
- ◆ Accreditation of prior learning.
- ◆ Work Experience — Mature candidates with suitable work experience may be accepted for entry provided the enrolling centre believes that the candidate is likely to benefit from undertaking the award.

Individual presenting centres will outline their systems for each of these as appropriate.

5 Structure of the Qualification

Core Units

Section A — All Units

Code	Unit	SCQF Level	Credit Value	% Laboratory Content
DG70 34*	Presentation skills in Science	7	1	0
D75X 34*	Information Technology: Applications Software 1	7	1	0
DF82 34*	Quality and Health and Safety systems in Science Industries	7	1	0
DH2K 34*	Fundamental Chemistry: Theory and Practice	7	2	40
DJ89 34*	Applied Sciences Graded Unit 1	7	1	0

Section B — Minimum of 1 credit

Code	Unit	SCQF Level	Credit Value	% Laboratory Content
DN8C 34*	Statistics for Science 1	7	1	0
DN8D 33*	Mathematics for Science 1	6	1	0

Section C — Minimum of 1 credit

Code	Unit	SCQF Level	Credit Value	% Laboratory Content
DH2J 34*	Biochemistry: Theory and Practice	7	1	10
DJ1K 34*	Cell Biology: Theory and Practice	7	1	10

*Assessment exemplars available

Section D — Optional Units — Maximum 4 credits required

Code	Unit	SCQF level	Credit Value	% Laboratory Content
DJ6Y 34	DNA: Structure and Function	7	1	10
DN8C 34	Statistics for Science 1	7	1	
DN8D 33	Mathematics for Science 1	6	1	
DH2J 34	Biochemistry: Theory and Practice	7	1	
DJ1K 34	Cell Biology: Theory and Practice	7	1	
DN33 33*	Physics 1	6	1	25
DG71 35	Human Body Structure and Function	8	2	10
DP2P 34	Fundamental Concepts of Organic Chemistry	7	1	30
DP2N 34	Fundamental Concepts of Inorganic Chemistry	7	1	25
DP2R 34	Fundamental Concepts of Physical Chemistry	7	1	25
DN37 34	Ecology and Ecosystems	7	1	25
DN38 34	Sustainable Development	7	1	10
DH55 34	Microbiology: Theory and Practice	7	2	20
DG6Y 34	Applied Biochemical Techniques	7	1	10
D033 13	Environmental Biology	7	1	20
DJ00 34	Biotechnology: An Introduction	7	1	20
DP4L 34	Animal Biology	7	1	0
DP4M 34	Plant Biology	7	1	0
DH2H 34	Animal and Plant Cell Culture: An Introduction	7	1	30
DP4P 34	Genetics	7	1	25
DP4Y 34	Environmental Chemistry	7	1	25
DN36 34	Earth Science	7	1	20
DN62 34	Managing Sites for Biodiversity	7	1	10
DX29 33	Fundamental Chemistry: An Introduction	6	1	0
DP9M 34	Science Industry: Key Issues	7	1	0
DH54 35	Instrumental Techniques: Theory Practice 1	8	1	20
DX2H 35	Organic Stereochemistry	8	1	
DV9F 35	Main Group Inorganic Chemistry	8	1	
FV6W 35	Spectroscopic and Analytical Techniques: Theory and Practice	8	1	
H0PM 35	Chemistry: Laboratory Practical Skills	8	1	
DN34 34	Physics 2	7	1	
DN4E 34	Digital Electronics	7	1	
FY9T 34	Analogue Electronic Principles	7	2	

Section E — Broadening Units — Maximum of 1 credit required

Code	Unit	SCQF level	Credit Value	% Laboratory Content
H8T2 33*	Workplace Communication in English	6	1	0
DE3R 34	Personal Development Planning	7	1	0

5.1 Laboratory Content

The hours shown in the table are a minimum estimate based on the mandatory practical assessment. It is envisaged that this practical content will be much higher due to the release of time for practical work by the introduction of end-of-unit assessment.

5.2 Graded Units

The purpose of the Graded Unit is to assess the candidate's ability to integrate and apply the knowledge and skills gained in the individual units to demonstrate that they have achieved the specific aims and to grade candidate achievement.

Candidates will undertake one Graded unit at SCQF level 7 in the HNC Applied Sciences Award. This will be a one credit Unit.

5.2.1 Type of Graded Unit

Investigation Report

This Unit will be a project based on an investigation which should take place during the last block of study. It will cover a range of skills achieved through studying the mandatory units of the award.

5.2.2 Rationale for Graded Unit assessment

Investigation Report

Candidates will be given a topic to research. They will produce a report covering the planning, developing and evaluation stages of the investigation.

An investigation report allows candidates to integrate knowledge and skills gained in the mandatory units. It allows them to use research skills, set timescales, experience working with others, improve self motivation and identify main issues, methods and sources of research. It also allows them to use scientific reporting skills in setting out the aims, data, analysis, summary, evaluation and references relevant to their investigation.

Should centres wish to develop their own assessment materials they can do so, but are strongly advised to contact SQA and seek prior moderation before use of their own devised assessments. Further guidance is available on Prior Moderation for Graded Units from SQA.

Centre internal moderation processes should ensure that all candidates have been fairly treated, that the assessment has been valid and reliable, and that the assessment decisions, marks and grades allocated are fair and in accordance with national standards. A suggested method for the internal moderation of the marking process is for the internal moderator to:

- ◆ Select and check a sample of scripts marked by the assessor — the sample should include A, B and C graded and fails.
- ◆ Decide whether the marking is:
 - at the appropriate standard
 - generally lenient, and by how much
 - generally severe, and by how much
 - lenient or severe at a particular point in the marks range, and by how much
 - inconsistent

- ◆ Discuss any problem cases with the assessor and agree on the appropriate adjustments to be made to the sampled scripts and, if necessary, to other scripts marked by the assessor.
- ◆ Complete the documentation which underpins any further action required.
- ◆ Make a judgement on the type of training/guidance/support to offer the assessor.

Further information on guidance in marking and making assessment decisions is available from SQA.

5.3 Core Skills

This award has been designed using the new design principles and therefore the importance of core skills has been recognised and these are developed throughout the award. These core skills may be embedded in the entry qualifications that the presenting candidates have already achieved, eg, Problem Solving at Intermediate 2 is embedded in all Science Highers. It should be noted that although there is no mandatory entry and exit levels the following is recommended:

Core Skill	Recommended Entry Level	Recommended Exit Level
Communication	Intermediate 2	Higher
Numeracy	Intermediate 1	Intermediate 2
Information Technology	Intermediate 2	Higher
Problem Solving	Intermediate 1	Intermediate 2
Working With Others	Intermediate 1	Intermediate 2

5.3.1 Embedded Core Skills

There may be opportunities to gather evidence towards Core Skills or Core Skills Components (**Appendix 1**) however there is only automatic certification as detailed below:

Core Skill	Component	HN Unit	Level	Mandatory/Optional Unit
Communication	Oral Communication	Presentation Skills in Science	Higher	M
	Written Communication	Presentation Skills in Science	Higher	M
Numeracy	Using Graphical Information			
	Using Number			
Information Technology	Using Information Technology	Information Technology: Applications Software 1	Higher	M

Core Skill	Component	HN Unit	Level	Mandatory/ Optional Unit
Problem Solving	Critical Thinking			
	Planning and Organising			
	Reviewing and Evaluating			
Working with Others				

5.4 SCQF Levels

The tables below show the distribution of SCQF levels.

Level 6	Level 7	Level 8	SQA Minimum Requirement for Level 7 units
16 optional SCQF credit points	48 mandatory 168 optional SCQF credit points	16 optional SCQF credit points	48 SCQF credit points

6. Approaches to Delivery and Assessment

6.1 Content and Context

The HNC Applied Sciences is a general science award which allows candidates to gain knowledge and transferable skills in general science subject areas. It allows a choice of options to enable the candidate to progress to their chosen HND (see **Appendix 2** for recommended requirements for entry to each HND). This award is aimed at those employed, or wishing to be employed at basic technician level.

The evidence of support from employers indicates that the structure and content of the awards meets their needs.

The award allows candidates to progress to a range of study options in Higher Education.

6.2 Delivery and Assessment

Although centres can choose what order in which to teach the units within the awards, guidelines have been produced on timetabling the mandatory units (**Appendix 3**). Every effort should be made to integrate both the teaching and assessment of units wherever possible.

The assessment strategy of the design principles to encourage a more holistic approach to assessment has been adopted. The new HN Unit specification places the emphasis on reducing assessment load for candidates and centres by devising assessments which assess the entire theory content of the unit where appropriate, and by sampling of knowledge and/or skills carried out under closed-book conditions on a random basis to ensure the candidates do not have prior knowledge of the sample.

Unit specifications detail exactly the evidence requirements and assessment procedures for each assessment event. Should centres wish to use a different mode of assessment from that recommended they should seek prior moderation from SQA.

6.3 Re-assessment

The way in which centres reassess candidates is integral to the way they manage the award assessment process as a whole. Reassessment should be subject to rigorous internal moderation in exactly the same way as first assessment.

Candidates may require to be reassessed on only a part of an assessment where their evidence has been generated over a period of time and/or a discrete part of the Unit, such as an outcome, has been assessed previously. On other occasions it may not be possible to reassess candidates on parts of their performance which are unsatisfactory. Situations where candidates may have to re-do a whole assessment include:

- ◆ assessments which test knowledge and understanding and where it may not be possible to extract some of the items for reassessment purposes
- ◆ where parts of several outcomes are involved
- ◆ where a project has been designed as an integral assessment and where there is a requirement to complete the project as a single complex task

6.3.1 Reassessment Opportunities

Reassessment should operate in accordance with a centre's assessment policy and the professional judgement of the assessor. SQA advises that there should normally be one, or in exceptional circumstances two reassessment opportunities. Please refer to the SQA publication *Guide to Assessment and Quality Assurance for Colleges of Further Education, August 2003 revision*.

6.3.2 Developing Alternative Assessments

The design of original assessments should inform the reassessment process to a large extent, as the original determines the type of assessment instruments used and the purpose of the assessment. It is normal practice for centres to build up a bank of assessments which can be used in whole or in part for reassessment purposes.

Assessment writers should always refer to the Unit specification when developing an alternative assessment to ensure that it is of equal demand to the original assessment and that it covers all the necessary criteria. Where candidates have not provided satisfactory evidence for knowledge and/or skills items which have been sampled, they should be reassessed on a different sample.

6.3.3 Prior Moderation

We strongly encourage centres to seek prior moderation of the assessment instrument and associated scheme they intend to use where these are not:

- ◆ NAB material
- ◆ on SQA approved assessment instrument and associated assessment scheme
- ◆ an assessment instrument and associated assessment scheme which has been successfully moderated.

The use of prior moderation may prevent problems arising at a later date.

6.3.4 Assessment Exemplars

Exemplar assessment instruments will be available for all mandatory units and a selection of optional units. The exemplars provide guidance on content, conduct, evidence required and marking and grading. Centres are expected to use these exemplars as templates when producing further assessment instruments.

6.3.5 Reassessing HN Graded Units

Candidates failing to achieve any of the minimum guidance requirements for all three sections should be offered the chance to re-submit the outstanding evidence. Re-submitted work should be awarded marks using a scale based on 50% of the original marks available.

Reassessment of the Graded Unit would take the form of resubmission of the evidence to show higher degrees of clarity and understanding.

Reassessment would be at the discretion of the centre and should be subject to rigorous internal moderation.

6.4 Relationship to other awards

This award is designed to provide a national HNC qualification in general science. It may be used as an entry qualification to a number of HND awards:

- ◆ Applied Science
- ◆ Applied Biology
- ◆ Biomedical Science
- ◆ Biotechnology
- ◆ Chemistry
- ◆ Environmental Science

Providing that the recommended options (**Appendix 2**) for progression to HND level are selected.

7 Guidance for Centres

7.1 Assessment Moderation

All assessment instruments used within this award should be internally moderated, including assessment exemplar materials, using appropriate policies within the centre and guidelines provided by SQA. This will ensure the validity and reliability of the instruments of assessment used within the centre.

External moderation will be carried out by SQA to ensure that internal assessment is within the national guidelines for these qualifications.

For further information on internal and external moderation refer to the SQA publication *Guide to Assessment and Quality Assurance for Colleges of Further Education*, August 2003 Revision.

7.2 Open and Distance Learning

HNC Applied Sciences could be delivered by Open Learning. Candidates would have to attend the presenting centre or other agreed institution to complete the practical assessments. Centre-devised supervision agreement should detail controlled conditions to ensure authenticity of evidence.

7.3 Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

7.4 Credit Transfer Transition Arrangements

In principle, candidates can be given credit transfer between current HNC/D units and new HN units. Details of these arrangements are available from SQA and in the Validation panel members' guide, Section 5.7.

Appendix 4 shows equivalences between units in HNC Applied Science (G601 15) and HNC Applied Sciences (G7V9 15) and is supplied for guidance only. Centres should assure themselves that students are able to provide evidence of a close matching of outcomes before credit transfer is given to candidates holding unit awards from other frameworks.

Given that there are a number of different HNC/D Science awards currently being delivered containing varying HN descriptors, mapping units and awards for credit transfer should be done on an individual basis in the manner described above for those candidates seeking 2nd year entry in the future.

8 General Information for Candidates

It is recommended that all candidates be given a copy of the qualification structure in section 5 with clarification and explanation as appropriate.

8.1 Course Content

In order to achieve the HNC you must accumulate 12 credits made up as follows:

Core	Section A	All 6 credits
Core	Section B	Minimum of 1 credit
Core	Section C	Minimum of 1 credit
Optional units	Section D	A maximum of 4 credits (see table below)
	Section E	Maximum of 1 credit

Routes to obtaining 12 credits

Route	Core Section A Credits	Core Section B Credits	Core Section C Credits	Options Credits	Total Credits
1	6	1	1	4	12
2	6	1	2	3	12
3	6	2	1	3	12
4	6	2	2	2	12

8.2 Laboratory Content

The hours shown in the table are a minimum estimate based on mandatory practical assessment.

It is envisaged that this practical content will be much higher due to the release of time for practical work by the introduction of end-of-unit assessment.

8.3 Access

8.3.1 Formal Qualifications

It is intended that admission to these awards should be as broadly based as possible, but that this should be consistent with the selection of candidates who have a reasonable chance of successfully completing the award (s). The following entry requirements are given as guidelines only:

- ◆ One Science Higher and not fewer than three Standard Grade 3 passes, including Chemistry, Biology, Biotechnology or Human Biology and Mathematics.
- ◆ National Qualification in an appropriate Science and Maths programme, such as Access to Science. Candidates should preferably possess some units at Higher level.
- ◆ Scottish Group Award (SGA) in Science at Intermediate 2.
- ◆ Qualification comparable to the above, gained through other awarding bodies, such as GCSE, City and Guilds, Edexcel.
- ◆ At the discretion of the Principal of the presenting centre for applicants with a different experiential background, who could benefit from taking the course or units within the course, eg adult returners, overseas candidates.

8.3.2 Alternative access arrangements

Most delivering centres are able to relax entrance requirements for mature applicants so if do not have the formal qualifications listed above then it may still be possible for you to be accepted providing that you are able to demonstrate, for example, that you have a background of work experience in the science area and possess Core Skills such as numeracy and literacy to the required levels. You will be asked to provide this evidence using one of the following methods (if you do not understand what any of them entails then please ask for more information).

- ◆ Assessment on demand.
- ◆ Credit Transfer.
- ◆ Accreditation of Prior Learning.
- ◆ Work Experience — Mature candidates with suitable work experience may be accepted for entry provided the enrolling centre believes that the candidate is likely to benefit from undertaking the award.

Individual presenting centres will outline their systems for each of these as appropriate.

8.4 Articulation

The award has been designed to provide the qualifications to demonstrate the relevant technical and transferable skills to enable immediate entry to employment while at the same time allowing articulation to degree courses.

It has also been the intention to provide students with a broad range of practical skills and as can be seen from the tables minimum practical content has been recommended where appropriate. Care has been taken in the design of the curriculum of these awards to ensure that topics and units required to maintain articulation routes are included. Thus no difficulty is foreseen in maintaining existing articulation routes. You should expect to progress to first or second years of degree course if you pass 15 credits (paying due regard to mandatory requirements).

8.5 Employment opportunities

The employment prospects for holders of the HNC are excellent. For example *Futureskills Scotland* published jointly by Highlands and Islands enterprise and Scottish Enterprise make labour market projections for the years 2003-2008. These predictions are based on an economic forecasting model produced by the researchers at the universities of Warwick and Cambridge. This model forecasts that within Scotland, in the periods covered, there

- ◆ will be 500,000 new jobs arising of which:
 - 103,000 will be in health and education
 - 5,000 will be in chemicals
 - 8,000 will be in manufacturing
 - 5,000 will be in the food, drink and tobacco industries and
- ◆ that 56% of these new jobs will require a qualification at HNC or above

This programme has been designed to meet the needs of this expanding employment market and you will develop the competences required to enhance your ability to obtain employment as a senior technician, junior laboratory manager or production process controller in Science based industries.

Typical job opportunities are diverse and include posts in:

- ◆ industrial research and development laboratories
- ◆ quality assurance laboratories
- ◆ college, university and research institute laboratories and
- ◆ local authority laboratories

Much of contemporary industrial production involves complex hi-tech processes. Supervision and control of such processes requires the knowledge and competences incorporated in the HNC Applied Sciences. Production control posts also exist in a wide range of industrial sectors including:

- ◆ chemical
- ◆ bio-medical
- ◆ pharmaceutical
- ◆ food processing
- ◆ textiles
- ◆ bio-technology
- ◆ soft drinks, brewing and distilling

The health care industry offers a wide range of technician posts including:

- ◆ Electron microscopy technician
- ◆ Perfusionists — following further training
- ◆ Phlebotomists — following further training
- ◆ Cytoscreeners — following further training
- ◆ Immunology research technician
- ◆ Biochemistry research technician
- ◆ Forensic Science technician

9 History of Changes

The SQA has set up a review panel to monitor and evaluate the appropriateness of the ward with respect to content, delivery and assessment.

It is therefore anticipated that changes will take place during the life of the qualification eg additional optional units/updated specifications and this section will record these changes.

The updated Arrangements document will be published on the SQA website and course leaders should ensure they check this document on a regular basis.

Date	Version Number	Description of Change
16/03/15	06	Revision of Unit: DE1K 33 Workplace Communication in English has been revised by H8T2 33 and finishes on 31/07/2016.
16/11/12	05	Added to framework: <i>Spectroscopic and Analytical Techniques</i> FV6W 35. <i>Chemistry: Laboratory Practical Skills</i> HOPM 35. <i>Physics 2</i> DN34 34. <i>Digital Electronics</i> DN4E 34. <i>Analogue Electronic Principles</i> FY9T 34.
04/07/07	04	Amendment to Group Award framework. Correction of spelling and punctuation errors.
17/01/07	03	Recommended options for progression to HND Applied Biological Sciences — removal of Unit Protein Structure and Function
17/06/06	02	Addition to Group Award framework. Removal of Graded Unit specification from Arrangements document. Alteration to Appendix numbers

APPENDIX 1

Core Skills Profile

Core Skills Profile

Units	Core Skills				
	Numeracy	Communication	Information Technology	Problem Solving	Working with Others
Statistics for Science 1	3 Higher				
Presentation Skills in Science		3 Embedded Higher			
Information Technology: Applications Software 1			3 Embedded Higher		
Quality and Health and Safety Systems in Science Industries		3 Higher			3 Intermediate 2
Fundamental Chemistry: Theory and Practice	3 Higher	3 Higher		3 Higher	
Cell Biology: Theory and Practice		3 Higher			
DNA Structure and Function		3 Higher			
Microbiology: Theory and Practice	3 Higher				
Animal and Plant Cell Culture: An Introduction		3 Higher		3 Higher	
Applied Sciences Graded Unit 1		3 Higher		3 Higher	
Biochemistry: Theory and Practice		3 Higher			
Applied Biochemical Techniques: An Introduction	3 Higher	3 Higher		3 Higher	
Human Body Structure and Function	3 Higher	3 Higher			
Environmental Biology					
Biotechnology: An Introduction		3 Higher			3 Higher
Mathematics for Science 1	3 Higher				
Ecology and Ecosystems		3 Higher	3 Higher		3 Higher
Sustainable Development		3 Higher	3 Higher		3 Higher
Animal Biology 1				3 Higher	
Plant Biology				3 Higher	
Genetics		3 Higher			
Environmental Chemistry					
Earth Science		3 Higher	3 Higher		3 Higher
Managing Sites for Biodiversity				3 Higher	
Fundamental concepts of Inorganic Chemistry	3 Higher	3 Higher		3 Higher	
Fundamental concepts of Organic Chemistry	3 Higher	3 Higher		3 Higher	
Fundamental concepts of Physical Chemistry				3 Higher	
Physics 1	3 Higher	3 Higher		3	

Communication (Higher)

Skill component Written Communication (Reading)

Read and Understand complex written communication

- a Identify and summarise all significant information, ideas and supporting details in a complex written environment
- b Evaluate fully the effectiveness of a communication in meeting its purpose and needs of its intended readership.

Unit	Knowledge and Skills/ Evidence	Developed/ Assessed	a	b
Presentation Skills in Science	Outcome 2	Assessed	√	√
Quality and Health & Safety in Science Industry	Outcome 1 and 2	Developed	3	3
Fundamental Chemistry: Theory and Practice	Outcome 1	Developed	3	3
Cell Biology: Theory and Practice	Outcomes 1, 2 and 4	Developed	3	3
DNA Structure and Function	Outcomes 1-5	Developed	3	3
Animal and Plant Cell Culture: An Introduction	Outcomes 1-3	Developed	3	3
Biochemistry: Theory and Practice	Outcomes 1-3	Developed	3	3
Applied Biochemical Techniques: An Introduction	Outcomes 1-4	Developed	3	3
Human Body Structure and Function	Outcomes 1-6	Developed	3	3
Ecology and Ecosystems	Outcome 3	Developed	3	
Sustainable development	Outcome 1	Developed	3	
Genetics	Outcomes 1, 2 3, and 4	Developed	3	
Earth Science	Outcome 1	Developed	3	
Physics 1	Outcome 4	Developed	3	
Fundamental concepts of Inorganic Chemistry	Outcome 2	Developed	3	3
Fundamental concepts of Organic Chemistry	Outcome 2	Developed	3	3

Written Communication (Writing)

Produce well-structured Written Communication on complex topics

- a Present all essential ideas/information and supporting detail in a logical and effective order
- b Use a structure which takes account of purpose and audience and links major and minor points in ways which assist the clarity and impact of the writing
- c Use conventions which are effective in achieving the purpose and adapted as necessary for the target audience
- d Use spelling, punctuation and sentence structures which are consistently accurate
- e Vary sentence structure, paragraphing and vocabulary to suit the purpose and target audience.

Unit	Knowledge/Skills/Evidence	Developed/ assessed	a	b	c	d	e
Presentation Skills in Science	Outcomes 1 and 3	Assessed	3	3	3	3	3
Quality and Health & Safety in Science	Outcome 3	Developed	3	3	3	3	3
Fundamental Chemistry: Theory and Practice	Outcomes 1 and 2	Developed	3	3	3		
Cell Biology: Theory and Practice	Outcomes 1,2 and 4	Developed	3	3	3		
DNA Structure and Function	Outcomes 1-5	Developed	3	3	3		
Microbiological Techniques: Theory and	Outcomes 1-5	Developed	3	3	3	3	3
Animal and Plant Cell Culture: An	Outcomes 1-4	Developed	3	3	3		
Biochemistry: Theory and Practice	Outcomes 1-3	Developed	3	3	3	3	3
Applied Biochemical Techniques: An	Outcomes 1-4	Developed	3	3	3	3	3
Human Body Structure and Function	Outcomes 1-6	Developed	3	3	3	3	3
Physics 1	Outcome 4	Developed	3	3	3		
Fundamental concepts of Inorganic Chemistry	Outcome 2	Developed	3	3	3		
Fundamental concepts of Organic Chemistry	Outcome 2	Developed	3	3	3		

Oral Communication

Produce and respond to oral Communication on a complex topic

- a Use vocabulary and a range of spoken language structures consistently and effectively at an appropriate level of formality
- b Convey all essential information, opinions or ideas with supporting detail accurately and coherently and with varied emphasis as appropriate
- c Structure communication to take full account of purpose and audience
- d Take account of situation and audience during delivery
- e Respond to others, taking account of their contributions

Unit	Knowledge/Skills Evidence	Developed/ Assessed	a	b	c	d	e
Presentation Skills in Science	Outcome 4	Assessed	3	3	3	3	3
Biotechnology: An Introduction	Outcome 5	Developed	3	3	3		3

Using Information Technology (Higher)

Use an IT system independently to process a range of information

- a Use a range of IT equipment paying attention to security and other users
- b Resolve one simple hardware or software problem
- c Use software in an unfamiliar context requiring some analysis and design, integration of data decision on output format
- d Carry out two searches to extract and present information from electronic data sources

Unit	Knowledge/Skills/Evidence	Developed/ Assessed	a	b	c	d
Information Technology: Applications Software 1	Embedded in unit	Assessed	3	3	3	3
Ecology and Ecosystems	Outcome 3	Developed	3		3	
Sustainable Development	Outcome 1 and 2	Developed	3			
Earth Science	Outcome 3	Developed	3			

Numeracy (Higher)

Skill component Using Number

Apply a wide range of numerical skills

- a Work confidently with a numerical or statistical concept
- b Decide on the steps and operations to be carried out
- c Carry out a number of sustained, complex calculations

Unit	Knowledge/Skills/Evidence	Developed/ Assessed	a	b	c
Statistics for Science 1	Outcomes 1 and 2	Developed	3	3	3
Fundamental Chemistry: Theory and Practice	Outcomes 1 and 2	Developed	3	3	3
Microbiology: Theory and Practice	Outcomes 2, 3 and 4	Developed	3	3	3
Applied Biochemical Techniques: An Introduction	Outcomes 1 and 2	Developed	3	3	3
Human Body Structure and Function	Outcome 3, 4 and 6	Developed	3	3	3
Mathematics for Science	All outcomes	Developed	3	3	
Fundamental concepts of Inorganic Chemistry	Outcome 2	Developed	3	3	
Fundamental concepts of Organic Chemistry	Outcome 2	Developed	3	3	
Physics 1	All outcomes	Developed	3	3	

Numeracy (Higher)

Skill component Using graphical information

Interpret and communicate graphical information in everyday and generalised contexts

- a Analyse and interpret complex graphical information
- b Select an appropriate form of table, graph, chart, diagram or qualitative form and communicate information in that form

Unit	Knowledge/Skills/Evidence	Developed/ assessed	a	b
Statistics for Science	Outcomes 1 and 2	Developed		3
Fundamental Chemistry: Theory and Practice	Outcomes 1 and 2	Developed		3
Microbiology: Theory and Practice	Outcomes 2, 3 and 4	Developed		3
Applied Biochemical Techniques: An Introduction	Outcomes 2 and 4	Developed		3
Human Body Structure and Function	Outcome 4 and 6	Developed		3

Problem Solving (Higher)

Skill components Critical Thinking

Analyse a complex situation or issue

- a Identify the factors involved in the situation or issue
- b Assess the relevance of these factors to the situation or issue
- c Develop and justify an approach to deal with the situation or issue

Unit	Knowledge/Skills/Evidence	Developed/ assessed	a	b	c
Fundamental Chemistry: Theory and Practice	Outcomes 1 and 2	Developed	3	3	3
Animal and Plant Cell Culture: An Introduction	Outcomes 1-4	Developed	3	3	3
Applied Biochemical Techniques: An Introduction	Outcomes 1-4	Developed	3	3	3
Applied Sciences: Graded Unit	All	Developed	3		

Problem Solving (Higher)

Skill components Planning and Organising

Plan, organise and complete a complex task

- a Develop a plan
- b Identify and obtain resources to carry out the plan
- c Carry out the task

Unit	Knowledge Skills/Evidence	Developed/ assessed	a	b	c
Fundamental Chemistry: Theory and Practice	Outcome 2	Developed	3	3	3
Animal and Plant Cell Culture: An Introduction	Outcome 4	Developed	3	3	3
Applied Biochemical Techniques: An Introduction	Outcomes 1-4	Developed	3	3	3
Applied Sciences: Graded Unit	All	Developed	3	3	3
Animal Biology 1	Outcome 4	Developed	3	3	3
Plant Biology	Outcome 4	Developed	3	3	3
Fundamental concepts of Inorganic Chemistry	Outcome 2	Developed	3	3	3
Fundamental concepts of Organic Chemistry	Outcome 2	Developed	3	3	3
Fundamental concepts of Physical Chemistry	Outcome 2	Developed	3	3	3
Physics 1	Outcome 4	Developed	3	3	3
Managing Sites for Biodiversity	Outcome 4	Developed	3	3	3

Problem Solving (Higher)

Skill components Reviewing and Evaluating

Review and evaluate a complex problem solving activity

- a Evaluate the effectiveness of the strategy/strategies
- b Identify and gather appropriate evidence
- c Draw conclusions and make recommendations

Unit	Knowledge/Skills/Evidence	Developed/ assessed	a	b	c
Fundamental Chemistry: Theory and Practice	Outcome 3	Developed	3	3	3
Applied Biochemical Techniques: An Introduction	Outcomes 1-4	Developed	3	3	3
Applied Sciences: Graded Unit	All	Developed	3	3	3

Working with Others (Intermediate 2)

Work with Others in a group to analyse, plan and complete an activity

- a analyse the activity and identify the component tasks and roles which make up the activity
- b agree allocation of responsibilities taking account of own strengths and weaknesses and those of others
- c support co-operative working
- d evaluate and draw a conclusion about own contribution to group activity, and justify this by referring to supporting evidence

Unit	Knowledge/Skills/Evidence	Developed/ Assessed	a	b	c	d
Quality and Health & Safety Systems in Science Industries	Outcome 3	Developed	3	3	3	

Working with Others (Higher)

Work with Others in a group to analyse, plan and complete a complex activity

- a analyse the activity by defining the goal to analyse, plan and complete a complex activity
- b negotiate roles and responsibilities with others, taking account of own strengths and weaknesses and those of colleagues
- c negotiate working methods and rules for managing the group's work
- d support co-operative working
- e evaluate and draw conclusions about own contribution to group activity, and justify this by referring to supporting evidence

Unit	Knowledge/Skills/Evidence	Developed/ Assessed	a	b	c	d	e
Employment Experience 2	Embedded unit	Assessed	3	3	3	3	3
Biotechnology: An Introduction	Outcome 5	Developed		3	3	3	
Ecology and Ecosystems	Outcome 3	Developed		3		3	
Sustainable Development	Outcome 1	Developed				3	
Earth Science	Outcome 2	Developed				3	

APPENDIX 2

Progression Routes to the HND Awards: Recommended HNC Content

Recommended options for progression to **HND Applied Sciences** could include:

- ◆ Cell Biology: Theory and Practice
- ◆ Microbiology; Theory and Practice
- ◆ DNA Structure and Function
- ◆ Organic Chemistry: Theory and Practice 1
- ◆ Inorganic Chemistry: Theory and Practice 1
- ◆ Physical Chemistry: Theory and Practice 1
- ◆ Physics 1
- ◆ Mathematics for Science 1

Recommended options for progression to **HND Biomedical Science** could include:

- ◆ Statistics for Science 1/Mathematics for Science 1
- ◆ Cell Biology Theory and Practice
- ◆ Human Body Structure and Function
- ◆ Microbiology; Theory and Practice
- ◆ DNA Structure and Function
- ◆ Biochemistry : Theory and Practice
- ◆ Applied Biochemical Techniques

Recommended options for progression to **HND Applied Biological Sciences** could include

- ◆ Statistics for Science 1/Mathematics for Science 1
- ◆ Cell Biology Theory and Practice
- ◆ Microbiology; Theory and Practice
- ◆ Animal Biology 1
- ◆ Plant Biology
- ◆ DNA Structure and Function
- ◆ Biochemistry : Theory and Practice

Recommended options for progression to **HND Biotechnology** could include:

- ◆ Statistics for Science 1/Mathematics for Science 1
- ◆ Cell Biology Theory and Practice
- ◆ Microbiology; Theory and Practice
- ◆ Biotechnology: An Introduction
- ◆ DNA Structure and Function

Recommended options for progression to **HND Chemistry** could include:

- ◆ Statistics for Science 1/Mathematics for Science 1
- ◆ Biochemistry: Theory and Practice
- ◆ Fundamental concepts of Inorganic Chemistry
- ◆ Fundamental concepts of Organic Chemistry
- ◆ Fundamental concepts of Physical Chemistry
- ◆ Physics 1

Recommended options for progression to **HND Environmental Sciences** could include:

- ◆ Statistics for Science 1
- ◆ Ecology and Ecosystems
- ◆ Earth Science
- ◆ Genetics
- ◆ Environmental Biology
- ◆ Sustainable Development

APPENDIX 3

Guidelines for timetabling of mandatory Units

Guidelines for timetabling of mandatory units

Block 1	Fundamental Chemistry: C	Microbiology O	Quality and H&S Systems C	Cell Biology O	IT:AS 1 C
Block 2			Presentation Skills in Science C	Biochemistry O	Biotechnology: An Introduction O
Block 3	Graded Unit C	DNA Structure and Function O	Statistics for Science C	Applied Biochemical Techniques O	Environmental Biology O

Plus additional optional Units as appropriate.

Delivering Centres not operating a three block delivery system may wish to timetable units in the order shown below

HNC Applied Sciences

Fundamental Chemistry
 Microbiology
 Quality and H&S Systems
 Cell Biology
 IT:AS 1
 Presentation Skills in Science
 Biochemistry
 Biotechnology: An Introduction
 Graded Unit
 DNA Structure and Function
 Statistics for Science
 Applied Biochemical Techniques
 Environmental Biology

The above scheme shows the HNC Applied Sciences options for HND1 Biotechnology. Similar schemes should be drawn up by centres offering other versions of HNC Applied Sciences appropriate to the HND (s) they intend to offer their students.

These schemes are for guidance only and centres are encouraged to consider alternative timetables particularly with regard to integrating delivery and assessment. For example it may be possible to deliver and assess Fundamental Chemistry concurrently with Presentation Skills for Science and thereby reduce the assessment burden for students as these two units have a degree of overlap in the assessment evidence requirements.

APPENDIX 4

Credit Transfer between Frameworks Exemplar

Credit Transfer between Framework — Exemplar

HNC Applied Science G601 15		HNC Applied Sciences Credit G7V9 15		Credit
Unit No	Unit Title			
D64R 04	Concepts in Inorganic & Organic Chemistry			
A6LG 04	Concepts in Physical Chemistry	DP2N 34	Fundamental Concepts Physical Chemistry	LO1 only
A5N2 04	Mathematics for Engineering 1	DN5D 33	Maths for Science 1	All
D64S 04	Laboratory Practice: Biology		None	
D64T 04	Laboratory Practice: Chemistry		None	
D64V 04	Laboratory Practice: Physics 1		None	
D64W 04	Laboratory Practice: Health and Safety in the Laboratory	DF82 34	Quality and Health and Safety Systems in the Science Industries	LO1 only
A6M3 04	Sampling and Descriptive Statistics	DN8C34	Statistics for Science 1	All
D5CM04	Communications: Selecting and Presenting Complex Information	DG70 34	Presentation Skills for Science	LO4 only
A6AM 04	Information Technology Applications 1	D75X 34	Information Technology: Applications Software 1	All
A6K0 04	Origin and Classification of Living Things		None	
A6JY 04	Cell Biology	DJ1K34	Cell Biology: Theory and Practice	LO1 and LO2 only
A6K1 04	Animalia: Structure, Taxonomy and Evolution		Animal Biology	
A6K2 04	Introduction to Genetics		Genetics	
A6K6 04	Plant Diversity		Plant Biology	
D64X 04	Physics 1	DN33 33	Physics1	LO1, LO2 and LO4 only
A6JS 04	Electromagnetism and Electromagnetic Induction		None	
A6JT 04	Electricity - Capacitance and Alternating Current Circuits		None	
A6JV 04	Electricity - Direct Current Circuits and Passive Components		None	
D64Y 04	Laboratory Practice: Physics 2		None	
A6LV 04	Physical Chemistry: Phase Equilibrium		None	