Arrangements for:

G8WV 15: HNC Bioscience
G8WY 16: HND Applied Bioscience
G906 16: HND Agricultural Science
G905 16: HND Green Technology

Validation date: March 2008

Date of original publication: July 2008

Version: 13 (October 23)

Acknowledgement

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Higher National qualifications.

History of changes

It is anticipated that changes will take place during the life of the qualification and this section will record these changes. This document is the latest version and incorporates the changes summarised below. Centres are advised to check SQA's APS Navigator to confirm they are using the up to date qualification structure.

NOTE: Where a Unit is revised by another Unit:

- No new centres may be approved to offer the Unit which has been revised.
- Centres should only enter candidates for the Unit which has been revised where they are expected to complete the Unit before its finish date.

Version number	Description	Date
13	**Added:** Cell Biology: Theory and Laboratory Skills (J2RE34) and Biochemistry: Theory and Laboratory Skills (H92234) as an optional choice to the older unit within the mandatory section of the framework. **Added:** Biotechnology: An Introduction (H92634) and Animal and Plant Cell Culture: An Introduction (H92034) as an optional choice to the older unit in the optional section of the framework.	31/10/23
12	**Revision of Units:** G8WV 15 and G8WY 16 Ecology and Ecosystems (J4RA 34) added as an alternative to Ecology and Ecosystems (H93A 34) which finishes on 31/07/2022	05/11/21
11	**Revision of Unit:** G8WV 15 and G8WY 16 Environmental Awareness - (J4RC 34) added as an alternative to Environmental Awareness - (F2G8 34) which finishes on 31/07/2022	04/05/21
10	**Revision of Unit:** F1RJ 34 Business Management: An Introduction (finish date 31/07/2021) has been replaced by J1BV 34 (start date 01/08/2018) for Agricultural Science, Applied Bioscience and Green Technology frameworks only. **Revision of Unit:** Wildlife Husbandry and Rehabilitation (finish date 31/07/2020) has been replaced by J1BE 34 Animal Care: Wildlife (start date 01/08/2018) for HND Applied Bioscience and HND Agricultural Science framework only	31/08/18 13/08/18
09	**Revision of Unit:** DV0M 34 Work Experience has been replaced by HJ4W 34 Work Placement and will finish 31/07/2019 for HND Agriculture Science/Applied Bioscience and Green Technology	28/03/17
08	**Revision of Unit:** F1Y8 34 Farm Power has been replaced by HG4Y 34 Farm Vehicles and Power to HNC Bioscience and HND Green Technology and will finish 31/07/2018	09/09/16
07	Additional Options DP1L 34, F2GB 34, DP4L 34, F3TY 34. Additional route added due to reduction of SCQF level of Statistics for Science 2 Unit H8XV 34 and DV08 35 to HND Applied Bioscience	30/09/15
06	**Removal of Unit** DH2H 34 and DJ00 34 from Mandatory section and add to **Optional Section** plus DP4P 34 from HND Applied Bioscience	31/07/15

06	**Additional of Optional** Unit DP4P 34 and F1J7 34 to HNC Bioscience. **Optional Unit** DP4P 34 to HND Agricultural Science**. Optional Unit**	31/07/15
05	**Applied Bioscience (G8WY 16) Revision of Units:** DN37 34 Ecology and Ecosystems has been revised by H93A 34.	26/05/15
04	**Green Technology (G905 16) and HND Agricultural Science Revision of Unit:** DV08 35 Statistics for Science 2 has been revised by H8XV 34. Old unit will finish on 31/07/2017.	11/05/15
Version number	**Description**	**Date**
03	**Applied Bioscience (G8WY 16)**: *Plant Growth and Development* (F21T 34) and *Plant Physiology* (F1MS 34) moved from mandatory to optional section. *Animal Welfare* (F3TX 34), *Arable Crop Production* (F1Y4 34), *DNA Structure and Function* (DJ6Y 34) *and Clinical Microbiology and Epidemiology* (DW8H 35) added as optional Units. **Agricultural Science (G906 16)**: *Plant Growth and Development* (F21T 34) moved from mandatory to optional section. *Animal Biology* (DP4L 34), *Animal Welfare* (F3TX 34), *DNA Structure and Function* (DJ6Y 34) and *Fundamentals of Landscape Surveying* (F1J7 34) added as optional Units. **Green Technology (G905 16)**: *Plant Growth and Development* (F21T 34) moved from mandatory to optional section. *Fundamentals of Landscape Surveying* (F1J7 34) added as optional Unit.	25/06/14
02	Addition of optional Unit DJ00 34 to HND Agricultural Science. Addition of optional Units F781 35, F782 35, F02P 34 and F4AK 34 to HND Green Technology.	13/08/10

Contents

1 Introduction

This is the Arrangements Document for the new Bioscience HNC and Green Technology HND**,** and for the revised Applied Bioscience HND and Agricultural Science HND, all validated in March, 2008. This document includes background information on the development of the Group Awards, their aims, guidance on access, details of the Group Award structures, and guidance on delivery.

The Group Awards are designed to equip candidates with the knowledge, understanding and skills required for success in current and future employment or for progression to further academic and/or professional qualifications.

2 Rationale for the development and revision of the Group Awards

Rationale for the development of the Bioscience HNC

Industrial market research identified employment opportunities for candidates with Bioscience HNC. The Applied Bioscience and Agricultural Science HND programmes include a common single year Bioscience HNC qualification. This means that candidates, who enrol for an HND but do not complete their studies, now have the opportunity to achieve an HNC as an exit route. The HNC also offers wider access to HND and degree programmes.

Rationale for the development of the Green Technology HND

Market research identified a growing need for personnel with knowledge, understanding and skills in sustainable technologies and renewable resources. The Green Technology HND allows candidates to articulate with the new Green Technology BSc.

Rationale for the revision of the Applied Bioscience HND

The Applied Bioscience HND aims to equip candidates with the knowledge, understanding and skills for laboratory-based jobs in this sector. This revised Group Award differs from applied biological science courses at other institutions in that it focuses on applications in crop and animal species rather than, human biology and biomedical aspects. Both the Applied Bioscience and the Agricultural Science HNDs articulate with BSc degrees in Applied Bioscience and Agricultural Science.

This revision of the Applied Bioscience HND and Agricultural Science HND updates Unit content and frameworks where required, and implements the current SQA Design Principles for HN Group Awards. Market Research into the Applied Bioscience HND showed that a high proportion of candidates were interested in animal science careers. In order to extend the progression opportunities of Applied Bioscience to enable entry to the third year of the new Applied Animal Science BSc as well as to Applied Bioscience BSc, the mandatory section of the HND is reduced to allow appropriate selection of optional Units for articulation.

Rationale for the revision of the Agricultural Science HND

Whilst the Applied Bioscience HND aims to equip candidates with the knowledge, understanding and skills for laboratory-based jobs in this sector, the Agricultural Science HND aims to prepare candidates for more field-based and consultancy jobs.

Both the Applied Bioscience HND and the Agricultural Science HND articulate with BSc degrees in Applied Bioscience and Agricultural Science. This revision of these Group Awards updates Unit content and frameworks where required and implements the current SQA Design Principles for HN Group Awards.

Market research

Lantra, the Sector Skills Council for the Environmental and Land-based Sector, has assessed the UK environmental and land-based sector as comprising over 235,000 businesses and employing over 1 million people[1]. The Sector Skills Development Agency forecast that the agricultural sector would have an overall net requirement for 86,000 employees between 2002 and 2012.[2]

Recent Lantra reviews of the employment levels and skills needs for the agricultural livestock industry[3], the agricultural crops industry[4] and the environmental conservation industry[5] show the relative importance of these sectors in terms of employment, as in the following table.

Lantra — Number of businesses and people employed in land-based sectors in Scotland

Industry sector	No. of businesses	No. employed
Agricultural Livestock Industry (Dec 2005)[3]	10,881	40,046
Agricultural Crops Industry (Dec 2005)[4]	3,644	14,062
Environmental Conservation Industry (Feb 2006)[5]	539	9,537

A number of relevant technical skills needs were identified by Lantra (2005)[6]:

- Agronomy
- Environmental management
- Animal welfare and behaviour
- Animal care (especially nutrition)

Lantra (2006)[7] reported that the agricultural livestock industry is becoming increasingly technical and there is a need for both degrees and HNC/HND qualifications among new employees joining the sector. In its 2007 reviews of the agricultural livestock[8] and agricultural crops sectors[9], Lantra also highlighted that changes in regulations and legislation mean that demonstrable competence will

[1] Lantra (2003) Environmental and Land-based Market Assessment
[2] SSDA (2004) The UK Skills and Productivity Agenda
[3] Lantra (2005) Sector Skills Agreement Stages 1-3 Report: Agricultural Livestock Industry
[4] Lantra (2005) Sector Skills Agreement Stages 1-3 Report: Agricultural Crops Industry
[5] Lantra (2006) Sector Skills Agreement Stages 1-3 Report: Environmental Conservation Industry
[6] Lantra (2005) The Key Drivers of Skill Demand in the Environmental and Land-based Sector
[7] Lantra (2006) Sector Skills Agreement Stages 5 Report: Agricultural Livestock Industry
[8] Lantra (2007) Sector Skills Agreement: Agricultural Livestock
[9] Lantra (2007) Sector Skills Agreement: Agricultural Crops

become increasingly important across the sector. Other trends affecting the industry which were identified by Lantra (2005)[10] as 'drivers of change in skills demand' include:

Globalisation

The predicted expansion in the global economy over the next decade is expected to open up new markets and opportunities for land-based industries but also bring increased risk and vulnerability through greater international competition.

Diversification

Over the next 20 years land-use is expected to diversify to areas including environmental protection, enhancement of biodiversity and the generation of renewable energy from sources such as the wind or crops for biomass and biofuels.

Technological change

Implementation of technological innovations will be required for land-based businesses to respond to rapidly changing market patterns.

Climate change

Climate change will affect the geographical distribution of crops as well as stimulating the demand for energy and biofuel crops.

Age

The age profile of the agricultural industry means that although total employment in agriculture has been in decline for several years, recruitment will continue.

The land-based sector is undergoing a period of radical change in response to these drivers, and Lantra concluded that the production industries are expected to become more knowledge-intensive in terms of both production technology and environmental impact.

Strong demand for employees with scientific and technological knowledge and understanding in the land-based sector is therefore anticipated.

A review of the demand for science graduates by the Scottish Executive, Scottish Funding Council and Futureskills Scotland (February 2007)[11] forecast that total employment in scientific occupations will grow at a faster rate between 2004 and 2014 than that expected for non-scientific occupations. A series of consultation exercises with a range of stakeholder groups began in March 2006. The following table gives an indication of the stakeholder groups consulted during the development phase of these Group Awards.

[10] Lantra (2005) The Key Drivers of Skill Demand in the Environmental and Land-based Sector

[11] Scottish Executive, the Scottish Funding Council and Futureskills Scotland (February 2007) *Supply of, and demand for, science graduates in Scotland: a review of available data.*

Summary of Stakeholder consultation

Stakeholder	Number returned	Returns %
	32	63
Current candidates		
	20	35
Past candidates	14	32
Staff delivering Applied Bioscience and Agricultural Science HNDs	19	63
Industrial liaison representatives		
Employers & potential employers: Applied Bioscience HND	13	34
Employers & potential employers: Agricultural Science HND	15	38
Employers & potential employers: Bioscience HNC	13	50
Renewable energy companies and environmental consultancies and	67	21
organisations	18	25
Further Education Institutions	2	14

Reviews of employment levels and skills requirements in the land-based sector by Lantra (The Sector Skills Council for the Environmental and Land-based Sector) and the Scottish Executive predict strong future demand for skilled employees in this sector, thereby confirming the continuing need for the Applied Bioscience and Agricultural Science HNDs.

Research conducted during the review of the Applied Bioscience and Agricultural Science HNDs showed that candidates, staff and industrial liaison representatives were very positive about the predecessor Group Awards. There were, however, clear indications that some changes to content would better serve the needs of candidates and employers.

3 Aims of the Group Awards

Below are the general and specific aims for the Bioscience HNC, Green Technology HND, Applied Bioscience HND and Agricultural Science HND.

3.1 Bioscience HNC

3.1.1 General Aims of the award

- Develop study and research skills in the area of bioscience
- Develop transferable skills including the Core Skills
- Develop candidates' ability to undertake planning, development, synthesis and evaluation in the area of bioscience
- Enable candidates' progression within the SCQF framework to HND level study
- Develop candidates' employment skills and enhance candidates' employment prospects, by providing the candidate with a wide range of practical and laboratory skills and an awareness of safe working practices and health and safety issues
- Provide a candidate-centred learning ethos which stimulates candidates to achieve their full intellectual potential and to develop independence of thought and an enquiring mind

3.1.2 Specific aims of the award

- Develop candidates' fundamental knowledge and understanding of cell biology, microbiology, biochemistry and environmental issues
- Enable candidates to develop a range of scientific and practical laboratory skills used by the bioscience industries
- Provide options to permit an element of vocational specialisation in areas of animal science, plant science, soil science, biotechnology, and the production of crops for food or energy generation
- Prepare candidates for employment at a junior technical or support level in bioscience industries
- Prepare candidates for HND and degree programmes in bioscience, including programmes in applied bioscience, agricultural science, applied animal science, green technology and related areas

3.2 Green Technology HND

3.2.1 General aims of the award

- Develop study and research skills in the area of renewable resources and sustainable technologies for rural areas, the evidence of which can be demonstrated throughout the award and also in the Graded Units
- Develop transferable skills including the Core Skills to be demonstrated across all Units
- Develop candidates' ability to undertake planning, development, synthesis and evaluation in the area of renewable resources and sustainable technologies for rural areas
- Enable candidates' progression within the SCQF framework to degree level study
- Develop candidates' employment skills and enhance candidates' employment prospects, by providing the candidate with a wide range of practical, laboratory, scientific and technical skills and an awareness of safe working practices, health and safety issues and business management
- Provide a candidate-centred learning ethos which stimulates candidates to achieve their full intellectual potential and to develop independence of thought and an enquiring mind

3.2.2 Specific aims of the award

- Provide the candidate with a deeper underpinning knowledge and understanding of the physical and biological sciences
- Develop candidates' knowledge and understanding of the application of physical and biological sciences to the development and use of sustainable technologies and renewable resources in rural areas
- Develop a range of scientific, technical and practical laboratory skills relating to the development and use of sustainable technologies and renewable resources in rural areas
- Develop candidates' knowledge and understanding of the environmental issues, economic considerations and regulatory factors that influence the development and use of sustainable technologies and renewable resources in rural areas
- Develop options to permit an element of vocational specialisation in areas of renewable energy generation, environmental building technologies, plant breeding, crop production and biotechnology

- Prepare candidates for employment at a technical or supervisory level with companies working in the areas of renewable energy, specialised plant products, crop breeding, pollution control and waste management or with environmental organisations and government departments
- Prepare candidates for progression to degree level study in Green Technology and related areas

3.3 Applied Bioscience HND

3.3.1 General aims of the award:

- Develop study and research skills in the area of biological sciences for the land-based sector.
- Develop transferable skills including the Core Skills
- Develop candidates' ability to undertake planning, development, synthesis and evaluation in the area of bioscience
- Enable candidates' progression within the SCQF framework to degree level study
- Develop candidates' employment skills and enhance candidates' employment prospects, by providing the candidate with a wide range of practical and laboratory skills and an awareness of safe working practices and health and safety issues
- Provide a student-centred learning ethos which stimulates candidates to achieve their full intellectual potential and to develop independence of thought and an enquiring mind

3.3.2 Specific aims of the award:

- Provide the candidate with a deeper underpinning knowledge of the biological and physical sciences relevant to the land-based industries
- Develop the candidates' knowledge and understanding of the applications of biological science and technology in the land-based industries and the environmental sector
- Develop scientific and practical laboratory skills, particularly in immunotechnology and DNA molecular technology
- Develop knowledge and understanding of ecological and environmental issues
- Develop options to permit an element of vocational specialisation in areas of applied crop science, applied animal science or environmental science
- Prepare candidates for progression to degree level study in Applied Bioscience, Applied Animal Science and related areas
- Prepare candidates for employment at a technical, supervisory or professional level in the land-based bioscience and biotechnology industries and for further vocational training in those industries

3.4 Agricultural Science HND

3.4.1 General aims of the award

- Develop study and research skills in the area of agricultural science, the evidence of which can be demonstrated throughout the award and also in the Graded Units
- Develop transferable skills including the Core Skills to be demonstrated across all Units
- Develop candidates' ability to undertake planning, development, synthesis and evaluation in the area of agricultural science
- Enable candidates' progression within the SCQF framework to degree level study
- Develop candidates' employment skills and enhance candidates' employment prospects, by providing the candidate with a wide range of practical, laboratory, scientific and technical skills and an awareness of safe working practices, health and safety issues and business management
- To provide a candidate-centred learning ethos which stimulates candidates to achieve their full intellectual potential and to develop independence of thought and an enquiring mind

3.4.2 Specific aims of the award

- Provide the candidate with a deeper underpinning knowledge and understanding of the biological and physical sciences of relevance to the agricultural industry
- Develop candidates' knowledge and understanding of the applications of scientific principles and techniques to support the agricultural industry.
- Develop a range of scientific, technical and practical laboratory skills used by the agricultural industry
- Develop candidates' knowledge and understanding of crop and livestock production systems, their management and the economic, environmental, regulatory and animal welfare issues that influence these sectors
- Develop options to permit an element of vocational specialisation in areas of farm scale renewable energy generation, wildlife management or the quality and processing of agricultural produce
- Prepare candidates for employment at a technical or supervisory level with the agricultural supply and support industries, as well as government departments, environmental agencies and regulatory bodies dealing with agricultural issues
- Prepare candidates for progression to degree level study in Agricultural Science and related areas

3.5 Target groups

These Group Awards will be suitable for a wide range of candidates including:

- School leavers
- Candidates studying access courses in science or biology
- Returners to education
- Candidates in employment who wish to enhance their career prospects
- People changing direction/ seeking a change in career
- Part-time candidates wishing to broaden skills and knowledge
- Candidates who wish to pursue a scientific career in the rural sector

3.6 Employment opportunities

The following information gives details on employment opportunities for the Bioscience HNC, Green Technology HND, Agricultural Science HND and Applied Bioscience HND.

3.6.1 Bioscience HNC

The Bioscience HNC may allow opportunities into employment pathways such as:

- Junior laboratory technician
- Assistant field technician
- Junior quality control technician

3.6.2 Green Technology HND

The Green Technology HND may allow opportunities into employment pathways such as:

- Energy audit officer
- Waste audit officer
- Waste management technician
- Environmental project officer
- Community liaison officer (utility company)
- Technical representative (renewable energy company)
- Crop trials technician

3.6.3 Agricultural Science HND

The Agricultural Science HND may allow opportunities into employment pathways such as:

- Field technician
- Crop trials assistant
- Agricultural officer
- Animal welfare officer
- Technical representative for agricultural supply industries (feeds, seeds, silage additives, animal health products, semen)

3.6.4 Applied Bioscience HND

The Applied Bioscience HND may allow opportunities into employment pathways such as:

- Laboratory Technician
- Animal technician
- Quality control officer
- Grain quality/creamery technician
- Technical representative

4 Access to awards

As with all SQA qualifications, access to the awards will be at the discretion of the centre.

Wider access to these Group Awards is encouraged and applicants may come from a wide range of backgrounds and experiences. Access to these Group Awards is designed to encourage and support the social inclusion agenda by providing entry routes for applicants with either traditional or non-traditional entry profiles. The ultimate criterion to be satisfied by any applicant seeking entry will be that they have a realistic chance of achieving the particular Group Award.

The opportunity to develop all Core Skills can be identified throughout the mandatory section of these Group Awards. This gives further support to candidates with non-traditional entry profiles to succeed at this level.

Core Skills Entry levels

Core Skills entry levels for the Bioscience HNC, Green Technology HND, Agricultural Science HND and Applied Bioscience HND are shown in the table below

Core Skill	Recommended minimum Entry level
Communication	4
Information Technology	4
Numeracy	4
Problem Solving	4
Working with Others	4

4.1 Recommended access

The following recommendations for the Bioscience HNC, Green Technology HND, Agricultural Science HND and Applied Bioscience HND are for guidance only.

Formal qualifications

Some examples of appropriate formal entry qualifications are specified below. They are not exhaustive or mutually exclusive and may be offered in a variety of combinations.

4.1.1 Bioscience HNC:

Two Highers (SCQF level 6) or 1 'A' level pass (SCQF level 7) preferably to include a science subject *plus*

English and Mathematics at Standard Grade at SCQF level 5 /GCSE equivalent

Or:

Possession of a National Certificate Group Award or other qualification at SCQF level 5/6 in a related subject area such as Life Science, Applied Science, Biological Science, Science, Biotechnology, Science and Technology.

4.1.2 Green Technology HND:

Two Highers (SCQF level 6) or 1 'A' level pass (SCQF level 7) to include a science subject, *plus*

English and Mathematics at Standard Grade at SCQF level 5/GCSE pass level or equivalent

Or:

A National Certificate Group Award or other qualification at SCQF level 5/6 in a related subject area such as Life Science, Applied Science, Biological Science, Science, Biotechnology, Science and Technology or Agriculture.

4.1.3 Applied Bioscience HND:

First year entry:

Two Highers (SCQF level 6) or 1 'A' level pass (SCQF level 7) to include Biology or Chemistry, *plus*

English and Mathematics at Standard Grade at SCQF level 5/GCSE pass level or equivalent

Or:

A National Certificate Group Award or other qualification at SCQF level 5/6 in a related subject area such as Life Science, Applied Science, Biological Science, Science, Biotechnology, Science and Technology.

Direct entry to second year of HND:

Candidates with Bioscience HNC together with the appropriate 3 bridging credits (see Section 5).

4.1.4 Agricultural Science HND:

First year entry:

Two Highers (at SCQF level 6) or 1 'A' level pass (SCQF level 7) to include Biology or Chemistry, *plus*

English and Mathematics at Standard Grade at SCQF level 5/GCSE pass level or equivalent

Or:

A National Certificate Group Award or other qualification at SCQF level 5/6 in a related subject area such as agriculture, life science, applied science, biological science, biotechnology, science and technology.

Direct entry to second year of HND:

Candidates with Bioscience HNC together with the appropriate 3 bridging credits (see Section 5).

Direct entry to second year of HND:

Candidates with Bioscience HNC together with the appropriate 3 bridging credits (see Section 5). Accreditation of prior experiential learning or alternative formal qualifications will be examined on an individual candidate basis.

Work experience

Candidates with suitable relevant work experience in lieu of normal entry requirements may be accepted provided that the enrolling centre is satisfied that the candidate is able to cope with the course and is likely to achieve the Group Award.

5 Award structures

5.1 Framework

5.1.1 Bioscience HNC

For a candidate to achieve the Bioscience HNC, they must attain all of the mandatory Units (56 SCQF credit points/7 SQA credits), including one Graded Unit at SCQF level 7, and optional Units worth 40 SCQF credit points/5 SQA credits.

Mandatory Units

Candidates must achieve all Units in this section:

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Cell Biology: Theory and Practice Or Cell Biology: Theory and Laboratory Skills	DJ1K 34 J2RE 34*	8 8	7 7	1 1
Biochemistry: Theory and Practice Or Biochemistry: Theory and Laboratory Skills	DH2J 34 H922 34*	8 8	7 7	1 1
Microorganisms: Growth, Activity and Significance	F21L 34	8	7	1
Quality and Health and Safety Systems in Science Industries	DF82 34	8	7	1
Environmental Awareness	J4RC 34*	8	7	1
Information Technology: Applications Software 1	D75X 34	8	7	1
Bioscience: Graded Unit 1	F39J 34	8	7	1

Optional Units

Candidates must achieve 40 SCQF points/5 SQA credits from this section:

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Plant Growth and Development	F21T 34	8	7	1
Chemistry and Physics for Life Sciences	F21J 34	8	7	1
Biotechnology: An Introduction Or Biotechnology: An Introduction	DJ00 34 H926 34*	8 8	7 7	1 1
Livestock Growth, Health and Welfare	F2E8 34	8	7	1
Livestock Breeding	F2E6 34	8	7	1

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Animal and Plant Cell Culture: An Introduction Or Animal and Plant Cell Culture: An Introduction	DH2H 34 H920 34*	8 8	7 7	1 1
Livestock Physiology: An Introduction	F21K 34	8	7	1
Plant Physiology	F1MS 34	8	7	1
Soils and Crop Establishment	F1YC 34	8	7	1
Crop Protection and Harvesting Mechanisation	F1Y6 34	8	7	1
Farm Vehicles and Power	HG4Y 34*	8	7	1
Arable Crop Production	F1Y4 34	8	7	1
Personal Development Planning	DE3R 34	8	7	1
Small Scale Rural Electrical Energy Systems	F2Y9 34	8	7	1
Genetics	DP4P 34*	8	7	1
Fundamental of Landscape Surveying	F1J7 34*	8	7	1

*Refer to History of Changes for revision changes.

Candidates intending to progress to an HND must choose appropriate optional Units for their intended HND progression route. Candidates intending to progress to the following Group Awards should choose from the following recommended options:

For progression to Applied Bioscience HND:

Eight from the following:

Unit code	Unit title
F21T 34	Plant Growth and Development
F21J 34	Chemistry and Physics for Life Sciences
DJ00 34	Biotechnology: An Introduction
F2E8 34	Livestock Growth, Health and Welfare
F2E6 34	Livestock Breeding
DH2H 34	Animal and Plant Cell Culture: An Introduction
F21K 34	Livestock Physiology
F1MS 34	Plant Physiology
DE3R 34	Personal Development Planning

For progression to Agricultural Science HND:

Eight from the following:

Unit code	Unit title
F21T 34	Plant Growth and Development
F21J 34	Chemistry and Physics for Life Sciences
F2E8 34	Livestock Growth, Health and Welfare

F2E6 34	Livestock Breeding
F21K 34	Livestock Physiology
F1MS 34	Plant Physiology
F1YC 34	Soils and Crop Establishment
F1Y4 34	Arable Crop Production
DE3R 34	Personal Development Planning

For progression to Green Technology HND:

Eight from the following:

Unit code	Unit title
F21T 34	Plant Growth and Development
F21J 34	Chemistry and Physics for Life Sciences
F1MS 34	Plant Physiology
F1YC 34	Soils and Crop Establishment
F1Y4 34	Arable Crop Production
F1Y6 34	Crop Protection and Harvesting Mechanisation
F1Y8 34	Farm Power
F2Y9 34	Small Scale Rural Electrical Energy Systems
DE3R 34	Personal Development Planning

5.1.2 Applied Bioscience HND

For a candidate to achieve the Applied Bioscience HND they must attain all of the mandatory Units (192 SCQF credit points/24 SQA credits), plus optional Units worth 48 SCQF credit points/6 SQA credits.

Mandatory Units – Route 1 - 21 credits needed

Candidates must achieve all Units in this section:

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Livestock Physiology	F21K 34	8	7	1
Livestock Breeding	F2E6 34	8	7	1
Livestock Growth, Health and Welfare	F2E8 34	8	7	1
Cell Biology: Theory and Practice	DJ1K 34	8	7	1
Biochemistry: Theory and Practice	DH2J 34	8	7	1
Chemistry and Physics for Life Sciences	F21J 34	8	7	1
Microorganisms: Growth, Activity and Significance	F21L 34	8	7	1
Quality and Health & Safety Systems in Science Industries	DF82 34	8	7	1
Information Technology: Applications Software 1	D75X 34	8	7	1
Environmental Awareness	J4RC 34*	8	7	1
Bioscience: Graded Unit 1	F39J 34	8	7	1

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Business Management: An Introduction	J1BV 34*	8	7	1
DNA Molecular Techniques: Theory and Practice	DJ6X 35	16	8	2
Immunotechnology: Theory and Practice	DH2M 35	8	8	1
Livestock Nutrition	F2EC 35	8	8	1
Agroecosystems: Energetic Efficiency	F2E5 35	8	8	1
Statistics for Science 2	H8XV 34*	8	7	1
Applied Bioscience: Graded Unit 2	F3D6 35	8	8	1
Applied Bioscience: Graded Unit 3	F3D7 35	8	8	1
Livestock Health: Approaches to Disease Control	F2E9 35	8	8	1

Applied Bioscience HND

For a candidate to achieve the Applied Bioscience HND they must attain all of the mandatory Units (192 SCQF credit points/24 SQA credits), plus optional Units worth 48 SCQF credit points/6 SQA credits.

Mandatory Units – Route 2 - 20 credits needed

Candidates must achieve all Units in this section:

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Livestock Physiology	F21K 34	8	7	1
Livestock Breeding	F2E6 34	8	7	1
Livestock Growth, Health and Welfare	F2E8 34	8	7	1
Cell Biology: Theory and Practice	DJ1K 34	8	7	1
Biochemistry: Theory and Practice	DH2J 34	8	7	1
Chemistry and Physics for Life Sciences	F21J 34	8	7	1
Microorganisms: Growth, Activity and Significance	F21L 34	8	7	1
Quality and Health & Safety Systems in Science Industries	DF82 34	8	7	1
Information Technology: Applications Software 1	D75X 34	8	7	1
Environmental Awareness	J4RC 34*	8	7	1
Bioscience: Graded Unit 1	F39J 34	8	7	1
Business Management: An Introduction	J1BV 34*	8	7	1
DNA Molecular Techniques: Theory and Practice	DJ6X 35	16	8	2
Immunotechnology: Theory and Practice	DH2M 35	8	8	1
Livestock Nutrition	F2EC 35	8	8	1
Agroecosystems: Energetic Efficiency	F2E5 35	8	8	1
Statistics for Science 2	DV08 35	8	7	1
Applied Bioscience: Graded Unit 2	F3D6 35	8	8	1
Applied Bioscience: Graded Unit 3	F3D7 35	8	8	1
Livestock Health: Approaches to Disease Control	F2E9 35	8	8	1

Optional Units – Route 1 – 9 Credits
Route 2 – 10 Credits

Candidates must achieve 48 SCQF points/6 SQA credits from this section:

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Plant Protection	F2B3 34	8	7	1
Crop Physiology and Breeding	F2AX 35	8	8	1
Biomass: Technologies for Energy and Bioproducts	F21H 35	8	8	1
Livestock Production Systems	F2ED 34	8	7	1
Grass and Fodder Crop Production	F1Y9 34	8	7	1
Livestock Health: Approaches to Disease Control	F2E9 35	8	8	1
Pollution and Waste Management: An Introduction	F2EE 34	8	7	1
Ecology and Ecosystems	J4RA 34*	8	7	1
Terrestrial Ecosystems	DP4X 35	8	8	1
Soils and Plant Nutrition	F1JL 35	8	8	1
Plant Protection: Integrated Approaches	F1JH 35	8	8	1
Personal Development Planning	DE3R 34	8	7	1
Work Placement	HJ4W 34*	8	7	1
Plant Growth and Development	F21T 34*	8	7	1
Plant Physiology	F1MS 34*	8	7	1
Animal Welfare	J1BG 34*	8	7	1
Arable Crop Production	F1Y4 34*	8	7	1
DNA Structure and Function	DJ6Y 34*	8	7	1
Clinical Microbiology and Epidemiology	DW8H 35*	8	8	1
Genetic	DP4P 34*	8	7	1
Animal and Plant Cell Culture: An Introduction	DH2H 34*	8	7	1
Biotechnology: An Introduction	DJ00 34*	8	7	1
Equine Studies: Equine Health	DP1L 34*	8	7	1
Wildlife Management	F2GB 34*	8	7	1
Animal Biology	DP4L 34*	8	7	1
Animal Behaviour	F3TY 34*	8	7	1

*Refer to History of Changes for revision changes.

Candidates intending to exit after completion of the HND could take any 6 credits from the above optional Units. The recommended streams for candidates intending to progress to BSc Applied Bioscience or BSc Applied Animal Science are presented below.

Applied Bioscience BSc stream:

Candidates should take the following three Units:

F2AX 35	Crop Physiology and Breeding
F21H 35	Biomass: Technologies for Energy and Bioproducts
F2B3 34	Plant Protection

Plus, any three from the following:

F2E9 35	Livestock Health: Approaches to Disease Control
F2EE 34	Pollution and Waste Management: An Introduction
J4RA 34*	Ecology and Ecosystems
DP4X 35	Terrestrial Ecosystems
F1JL 35	Soils and Plant Nutrition
F1JH 35	Plant Protection: Integrated Approaches
DE3R 34	Personal Development Planning
DV0M 34	Work Experience

Applied Animal Science BSc stream:

Candidates should take the following three Units:

F2E9 35	Livestock Health: Approaches to Disease Control
F2ED 34	Livestock Production Systems
F1Y9 34	Grass and Fodder Crop Production

Plus any three from the following:

F2EE 34	Pollution and Waste Management: An Introduction
J4RA 34*	Ecology and Ecosystems
DP4X 35	Terrestrial Ecosystems
F1JL 35	Soils and Plant Nutrition
DE3R 34	Personal Development Planning
DV0M 34	Work Experience

5.1.3 Agricultural Science HND

For a candidate to achieve the Agricultural Science HND, they must attain all of the mandatory Units (216 SCQF credit points/27 SQA credits), plus optional Units worth 24 SCQF credit points/3 SQA credits.

Mandatory Units

Candidates must achieve all Units in this section:

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Livestock Physiology	F21K 34	8	7	1
Livestock Breeding	F2E6 34	8	7	1
Livestock Growth, Health and Welfare	F2E8 34	8	7	1
Plant Physiology	F1MS 34	8	7	1
Cell Biology: Theory and Practice	DJ1K 34	8	7	1
Biochemistry: Theory and Practice	DH2J 34	8	7	1
Chemistry and Physics for the Life Sciences	F21J 34	8	7	1
Microorganisms: Growth, Activity and Significance	F21L 34	8	7	1
Quality and Health and Safety Systems in Science Industries	DF82 34	8	7	1
Information Technology Applications Software 1	D75X 34	8	7	1
Environmental Awareness	J4RC 34*	8	7	1
Arable Crop Production	F1Y4 34	8	7	1
Soils and Crop Establishment	F1YC 34	8	7	1
Bioscience Graded Unit	F39J 34	8	7	1
Agroecosystems: Energetic Efficiency	F2E5 35	8	8	1
Soils and Plant Nutrition	F1JL 35	8	8	1
Plant Protection	F2B3 34	8	7	1
Grass and Fodder Crop Production	F1Y9 34	8	7	1
Livestock Nutrition	F2EC 35	8	8	1
Livestock Production Systems	F2ED 34	8	7	1
Farm Manures, Wastes and the Environment	F1Y7 35	8	8	1
Land Use Systems	F2GA 35	8	8	1
Statistics for Science 2	H8XV 34*	8	8	1
Business Management: An Introduction	J1BV 34*	8	7	1
Agricultural Science: Graded Unit 2	F3R1 35	8	8	1
Agricultural Science: Graded Unit 3	F3R2 35	8	8	1

Optional Units

Candidates must achieve 24 SCQF points/3 SQA credits from this section:

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Livestock Health: Approaches to Disease Control	F2E9 35	8	8	1
Plant Protection: Integrated Approaches	F1JH 35	8	8	1
Specialised Field Crops	F2EG 35	8	8	1
Crop Physiology and Breeding	F2AX 35	8	8	1
Agricultural Produce: Quality and Processing	F2E4 35	8	8	1
Wildlife Management	F2GB 34	8	7	1
Farm Scale Renewable Energy	F2G9 35	8	8	1
Personal Development Planning	DE3R 34	8	7	1
Work Placement	HG4W 34*	8	7	1
Biotechnology: An Introduction	DJ00 34	8	7	1
Plant Growth and Development	F21T 34*	8	7	1
Animal Biology	DP4L 34*	8	7	1
Animal Welfare	J1BG 34*	8	7	1
DNA Structure and Function	DJ6Y 34*	8	7	1
Fundamentals of Landscape Surveying	F1J7 34*	8	7	1
Genetic	DP4P 34*	8	7	1

Refer to History of Changes for revision changes.

5.1.4 Green Technology HND

For a candidate to achieve the Green Technology HND, they must attain all of the mandatory Units (216 SCQF credit points/27 SQA credits), plus optional Units worth 24 SCQF credit points/3 SQA credits.

Mandatory Units

Candidates must achieve all Units in this section:

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Arable Crop Production	F1Y4 34	8	7	1
Plant Physiology	F1MS 34	8	7	1
Cell Biology: Theory and Practice	DJ1K 34	8	7	1
Biochemistry: Theory and Practice	DH2J 34	8	7	1
Chemistry and Physics for Life Sciences	F21J 34	8	7	1
Microorganisms: Growth, Activity and Significance	F21L 34	8	7	1
Quality and Health and Safety Systems in Science Industries	DF82 34	8	7	1
Information Technology: Applications Software 1	D75X 34	8	7	1
Environmental Awareness	J4RC 34*	8	7	1
Crop Protection and Harvesting Mechanisation	F1Y6 34	8	7	1
Soils and Crop Establishment	F1YC 34	8	7	1
Farm Vehicles and Power	HG4Y 34*	8	7	1
Small Scale Rural Electrical Energy Systems	F2Y9 34	8	7	1
Bioscience Graded Unit: Investigation	F39J 34	8	7	1
Agroecosystems: Energetic Efficiency	F2E5 35	8	8	1
Statistics for Science 2	H8XV 34*	8	8	1
Business Management: An Introduction	J1BV 34*	8	7	1
Farm Scale Renewable Energy	F2G9 35	8	8	1
Renewable Energy Systems: Microgeneration Systems	F1YK 34	8	7	1
Energy Performance of Buildings	F32B 35	8	8	1
Land Use Systems	F2GA 35	8	8	1
Pollution and Waste Management: An Introduction	F2EE 34	8	7	1
Biomass: Technologies for Energy and Bioproducts	F21H 35	8	8	1
Transport Towards a Sustainable Future	F2EH 35	8	8	1
Green Technology: Graded Unit 2	F3PY 35	8	8	1
Green Technology: Graded Unit 3	F3R0 35	8	8	1

Optional Units

Candidates must achieve 24 SCQF points/3 SQA credits from this section:

Unit title	Code	SCQF credit points	SCQF level	SQA credit value
Biotechnology: An Introduction	DJ00 34	8	7	1
Genetics for Plant Science	F1MK 35	8	8	1
Soils and Plant Nutrition	F1JL 35	8	8	1
Plant Protection	F2B3 34	8	7	1
Crop Physiology and Breeding	F2AX 35	8	8	1
Farm Buildings and Controlled Environments	F2G7 35	8	8	1
Environmental and Countryside Regulation	F2GC 34	8	7	1
Business Law: An Introduction	DE3E 34	8	7	1
Personal Development Planning	DE3R 34	8	7	1
Work Placement	HJ4W 34*	8	7	1
Environmental Auditing of Buildings	F781 35	8	8	1
Low Environmental Impact Construction	F782 35	8	8	1
Mathematics for Construction Engineering	F02P 34	8	7	1
Scottish Rural Development	F4AK 34	8	7	1
Plant Growth and Development	F21T 34*	8	7	1
Fundamentals of Landscape Surveying	F1J7 34*	8	7	1

*Refer to History of Changes for revision changes.

Recommended Core Skills Entry and Exit levels

Suggested entry and exit Core Skills levels for the Bioscience HNC, Green Technology HND, Agricultural Science HND and Applied Bioscience HND can be found in the following table

Core Skill	Recommended Minimum Entry level HNC/HND	Recommended Exit level HNC	Recommended Exit level HND
Communication	4	5	6
Information Technology	4	6	6
Numeracy	4	5	6
Problem Solving	4	5	6
Working with Others	4	5	6

Graded Units

The Graded Units were selected in response to feedback from stakeholders. The choice of a project for Bioscience HNC was in response to a need to focus on operational practioner skills and the application of knowledge and skills acquired during this first year. For similar reasons a project based approach was still favoured in the second year of all the HND programmes. However, due to the large number of candidates moving onto undergraduate programmes and the need to know/recall requirements for vocational outlets, an examination was also considered appropriate. To accommodate both these views, a project and an examination format have been adopted for the second year Graded Units on all the HND awards. The table below gives further details.

Group Award	**Year 1**	**Year 2**	
Bioscience HNC (Year 1 HNDs)	Graded Unit 1: Project: Investigation	N/A	
Applied Bioscience HND	Graded Unit 1: Project: Investigation	Graded Unit 2: Project Investigation	Graded Unit 3: Examination: closed-book
Agricultural Science HND	Graded Unit 1: Project: Investigation	Graded Unit 2: Project: Case Study	Graded Unit 3: Examination: closed-book
Green Technology HND	Graded Unit 1: Project: Investigation	Graded Unit 2: Project: Case Study	Graded Unit 3: Examination: closed-book

5.2 Mapping information

Appendix 1 shows the mapping of aims to individual units for each award.

5.2.1 National Occupational Standards

Sector Skill bodies are now taking prominent positions within the development and structure of vocational training as well as providing occupational standards to be met within each subject area. These standards were considered when building the new and revised Group Awards. Many Units in the frameworks have a degree of commonality with Occupational Standards and these links are detailed in Appendix 2.

5.2.2 Core Skills

Core Skills Mapping can be found in Appendix 3.

5.3 Articulation, professional recognition and credit transfer

5.3.1 Articulation and employment opportunities arising after further study

All the Group Awards are designed to offer progression opportunities to degree programmes. Successful articulation and completion of a degree may also offer further or varied employment opportunities to those identified in Section 3.6. Details of these articulation routes and possible employment opportunities are given below for each Group Award.

Bioscience HNC

The Bioscience HNC is designed to enable progression into year 2 of the HNDs below, and to degree programmes, to further enhance employment opportunities.

- Applied Bioscience
- Agricultural Science
- Green Technology

It may also enable entry to other HND and degree programmes in biological sciences, and it is advisable to check any specific entry requirements with the appropriate university admissions departments.

Green Technology HND

The Green Technology HND is designed to articulate with year 3 of BSc Green Technology which is validated by the University of Glasgow and delivered by SAC, as with the other degrees in Agricultural Science, Applied Bioscience, and Applied Animal Science. This articulation route may provide candidates with opportunities to enter the aforementioned areas of employment at a higher level, and could also open up a much wider range of possible career pathways, such as:

- Energy development officer
- Environmental consultant
- Environmental technology project manager
- Waste management officer
- Specialised crops trials manager
- Plant product development researcher
- Carbon management consultant
- Carbon logistics specialist
- Energy account manager

There may be other progression routes to related courses at other Higher Education establishments which further broaden possible career pathways. It is advisable to check any specific entry requirements with the appropriate university admissions departments at an early stage of the HND programme.

Agricultural Science HND

The Agricultural Science HND is designed to articulate with year 3 of BSc Agricultural Science which is validated by the University of Glasgow and delivered by SAC, as with the other degrees in Green Technology, Applied Bioscience, and Applied Animal Science. This articulation route may allow opportunities to enter the aforementioned jobs at a higher level, and could also open up a much wider range of possible career pathways, such as:

- Farm conservation adviser (FWAG)
- Trainee agricultural consultant (SAC)
- Field trials manager
- Assistant farm business manager
- Crop consultant
- Ruminant nutritionist

There are other progression routes to related courses at other Higher Education establishments which further broaden possible career pathways. It is advisable to check any specific entry requirements with the appropriate university admissions departments at an early stage of the HND programme.

Applied Bioscience HND

The Applied Bioscience HND is designed to articulate with year 3 of Applied Bioscience BSc, or Applied Animal Science BSc, according to choice of second year optional Units. These degrees are validated by the University of Glasgow and delivered by SAC, as with the other degrees in Green Technology and Agricultural Science. These articulation routes may provide opportunities to enter a much wider range of possible career pathways, such as:

- Research assistant (eg animal welfare, avian science, molecular biology)
- Plant pathologist
- Diagnostics consultant
- Media production manager (tissue culture)
- Production controller (Pharmaceuticals)
- Veterinary research assistant
- Animal Health Officer
- Pharmaceuticals sales executive
- Livestock nutritionist
- Evaluation officer (genetics and breeding)

There are other progression routes to biological science courses at other Higher Education establishments which further broaden possible career pathways. It is advisable to check any specific entry requirements with the appropriate university admissions departments at an early stage of the HND programme

5.3.2 Credit transfer arrangements

There are no frameworks for transition from the first year of the predecessor Agricultural Science and Applied Bioscience HNDs and the second year of the revised HNDs.

Credit transfer can be given where there is broad equivalence between the subject related content of the Unit or combinations of Units. Candidates who are given credit transfer between predecessor Units and revised HN Units must still satisfy all other conditions of the Group Award, including achievement of all the Graded Units.

Credit transfer can be given for individual Units developed under the 1988 design rules and the revised Units developed under the 2003 design principles.
The following table indicates credit transfer arrangements, from predecessor to revised Units, which have been externally verified. Where credit transfer is not a direct match, guidance is included in the credit transfer conditions column.

Revised Unit code	Revised Unit title	Predecessor Unit code	Predecessor Unit title	Credit transfer conditions
DH2H 34	Animal and Plant Cell Culture: An Introduction	D7TJ 04	Cell and Tissue Culture	Complete
F1Y4 34	Arable Crop Production	D7TG 04	Arable Crop Production	Complete
DH2J 34	Biochemistry: Theory and Practice	D7TH 04 D7TM 04 D7V4 04	Outcomes 2 & 3 of Biochemistry of Cells Outcomes 2 & 3 of Energy and Metabolism Outcome 1 of Plant Physiology	Complete by combination stated.
DJ00 34	Biotechnology: An Introduction	D7VC 04 D7V8 04 D7TK 04	Biotechnology for Food, Land and Environment: An Introduction Recombinant Technology Outcome 1 of Cells and the Fundamentals of Life	Complete by combination stated.
FIRJ 34	Business Management: An Introduction	DF7D 04	Business Management: An Introduction	Complete
DJ1K 34	Cell Biology Theory and Practice	D7TK 04 D7TH 04	Outcomes 1 & 2 of Cells and the Fundamentals of Life Outcome 4 of Biochemistry of Cells	Complete by combination stated.
F21J 34	Chemistry and Physics for the Life Sciences	DF8R 04	Chemistry and Physics for the Life Sciences: An Introduction	Complete
J4RA 34*	Ecology and Ecosystems	H93A 34	Ecology and Ecosystems	Complete
J4RC 34*	Environmental Awareness	F2G8 34	Environmental Awareness	Complete
F1Y9 34	Grass and Fodder Crop Production	D7TP 04	Grass and Fodder Crop Production	Complete
D75X 34	Information Technology Applications Software 1	DG0T 04	Practical Use of Software Applications Packages	Complete
F2E6 34	Livestock Breeding	D7TW 04 D7TN 04	Outcomes 1 & 2 of Livestock Breeding and Health Outcomes 3 & 4 of Genetics	Complete by combination stated.

Revised Unit code	Revised Unit title	Predecessor Unit code	Predecessor Unit title	Credit transfer conditions
F21K 34	Livestock Physiology	D7TE 04 D7TM 04	Outcomes 1, 2 & 4 of Animal Physiology Outcomes 3 & 4 of Energy and Metabolism	Complete by combination stated.
F2ED 34	Livestock Production Systems	D7VB 04	Systems of Livestock Production	Complete
F21L 34	Microorganisms: Growth, Activity and Significance	D7V2 04	Microbial Growth and Activity	Complete
F21T 34	Plant Growth and Development	D7V3 04	Plant Growth and Development	Complete
F1MS 34	Plant Physiology	D7V4 04	Plant Physiology	Complete
F2B3 34	Plant Protection	D7V5 04	Plant Protection: An Introduction	Complete
DF82 34	Quality and Health & Safety Systems in Science Industries	D7TT 04 D7V7 04	Laboratory Safety Quality Assurance in the Laboratory	Complete
F2EE 34	Pollution and waste Management: An Introduction	D7V6 04	Pollution and Waste Management: An Introduction	Complete
DV0M 34	Work Experience	DG0W 04	Work Experience	Complete
F2AX 35	Crop Physiology and Breeding	D7TF 04 D7V3 04	Applied Crop Physiology Outcome 4 of Plant Growth and Development	Complete by combination stated.
DJ6X 35	DNA Molecular Techniques: Theory and Practice	D7V8 04	Recombinant Technology	Partial: Old Unit equivalent to Outcomes 1 & 4 of new Unit
F1Y7 35	Farm Manures, Wastes and the Environment	D7V6 04	Pollution and Waste Management: An Introduction	Complete
F2GA 35	Land Use Systems	D7TV 04	Land Use Systems	Complete
F2E9 35	Livestock Health: Approaches to Disease Control	D7TX 04	Livestock Health and Welfare	Complete
F2EC 35	Livestock Nutrition	D7TY 04	Livestock Nutrition	Complete
F1JH 35	Plant Protection: Integrated Approaches	D7TR 04	Integrated Plant Protection	Complete
F1JL 35	Soils and Plant Nutrition	D7VA 04	Soils and Crop Nutrition	Complete
F2EG 35	Specialised Field Crops	DF1A 04	Specialised Field Crops	Complete

6 Approaches to delivery and assessment

This suite of Group Awards provides candidates with scientific and technical knowledge understanding and skills for applications in the land based industries. The particular context of the individual awards is outlined in the following paragraphs.

The **Bioscience HNC** should allow candidates to develop a foundation of knowledge, understanding, skills and practical techniques in the areas of cell biology, biochemistry and microbiology. It also allows a choice of optional Units focusing on the biological sciences of particular relevance for the land-based sector, together with other broadening Units to prepare them for progression to Higher Education or employment at technical or support level.

The **Applied Bioscience HND** allows candidates to further develop knowledge, understanding and skills in relevant biological sciences and their applications in the land-based industries, including the crop, livestock and environmental sectors, in order to prepare them for degree level study or for employment in a technical, supervisory or professional post in the land-based industries. It allows a choice of options and streams to provide articulation routes to degree programmes in Applied Bioscience or Applied Animal Science.

The **Agricultural Science HND** allows candidates to develop knowledge, understanding and skills in the science underpinning and supporting the agricultural industry, together with an understanding of the economic, environmental and ethical context in which the agricultural sector operates. It could also prepare candidates for degree level studies or for employment at technical or supervisory level in this sector. Candidates study the latest systems for crop and livestock production and can choose from a wide range of optional Units, including *Farm Scale Renewable Energy, Wildlife Management* or *Agricultural Produce: Quality and Processing*.

The **Green Technology HND** allows candidates to develop the technical and scientific knowledge, understanding and skills required for the development and use of sustainable technologies and renewable resources in rural areas. This could also prepare candidates for degree level studies or for employment at technical or supervisory level in this sector. As well as providing a broad foundation in science, it covers small scale renewable energy systems, green building technologies, pollution and waste management, the production and exploitation of biomass for energy and bioproducts together with Units focusing on the land use and environmental issues that influence these developments.

Evidence of support from employers indicates that the structure and content of each of the Group Awards meets their needs.

Another important aim is to enable candidates to access opportunities in Higher Education. This is particularly important in scientific professions.

Mode of delivery

Unit delivery will be by a combination of lectures, computer, laboratory and workshop practicals, discussion groups, tutorials and farm and industrial visits.

The awards can be delivered in many different modes of attendance including full-time, part-time and Flexible Learning patterns.

Part-time study may fall into one or more of the following patterns:

- Discrete HNC/HND courses run over a number of years
- Cluster of Units
- Continuing Professional Development as required by individual candidates based in employment
- Individual Units selected for personal interest and development

Individual Units could be offered on an open learning or e-line basis, especially if there is the possibility of home based study of more factual information. Under all circumstances, delivering centres will be responsible for ensuring authenticity of candidates' work.

Sequence of delivery

There is reasonable flexibility in the sequence of Unit delivery, but it is recommended that Units on a lower SCQF level in a subject area are taught in advance of those at a higher level, and suggested delivery schedules are shown in Appendix 4.

7 General information for centres

Candidates with disabilities and/or additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering alternative Outcomes for Units. Further advice can be found in the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs* **(www.sqa.org.uk)**.

Internal and external verification

All instruments of assessment used within this/these Group Award(s) should be internally verified, using the appropriate policy within the centre and the guidelines set by SQA.

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

Further information on internal and external verification can be found in *SQA's Guide to Assessment and Quality Assurance for Colleges of Further Education* **(www.sqa.org.uk)**.

8 General information for candidates

Bioscience HNC

The **Bioscience HNC** has been designed to meet the demands and requirements of today's modern working environment. Opportunities are provided to develop skills, knowledge and understanding required for progression to Higher Education in biological sciences, or for employment at technical or support level in the land-based and bioscience industries, and for further vocational training in those industries.

Conditions for the award of Bioscience HNC

For you to achieve the HNC, you must attain all of the mandatory Units (56 SCQF credit points/7 SQA credits) and optional Units worth 40 SCQF credit points/5 SQA credits.

The HNC extends over one year of full-time study, but can be taken on a part-time basis. It is delivered by means of lectures, practical and laboratory classes, tutorials and industrial visits. You will study a range of biological subjects such as cell biology, biochemistry and microbiology, as well as learning about environmental issues and also health, safety and quality assurance in the science industries. Throughout the HNC you will have the opportunity to further develop Core Skills in Communication, Numeracy, Information Technology, Problem Solving and Working with Others. The inclusion of a broad range of options allows you to develop your individual abilities and interests, leading to a range of progression and employment paths.

Assessment strategy

Assessments may include tests, practical assessments, assignments, reports and projects. The overall assessment strategy is a holistic approach to assessment.

Graded Units

This Graded Unit is at SCQF level 7 and is worth 1 Unit credit. It is designed to assess and grade your ability to undertake planning, research, evaluation and scientific report writing in the field of Bioscience. Tutors can refer you to how particular Units might influence your Graded Unit response. The Graded Unit for this award is an investigation and may be introduced to you at the beginning of your study.

Employment opportunities

The Bioscience HNC may provide opportunities for you to progress into employment pathways, potentially leading to positions such as:

- Junior laboratory technician
- Assistant field technician
- Junior quality control technician

Progression routes to Higher Education

The Bioscience HNC is designed to enable progression into year 2 of the following HND programmes, to further enhance your employment opportunities:

- Applied Bioscience
- Agricultural Science
- Green Technology

It may also enable entry to other HND and degree programmes in biological sciences. You are advised to check any specific entry requirements with the appropriate university admissions departments.

Applied Bioscience HND

The **Applied Bioscience HND** has been designed to meet the demands and requirements of today's land-based bioscience industries. It aims to develop knowledge, understanding and skills in relevant biological sciences and their applications in the land-based industries, including the crop, livestock and environmental sectors, in order to prepare candidates for degree level study or for employment in a technical, supervisory or professional post in the land-based bioscience industries.

Conditions for the award of Applied Bioscience HND

For you to achieve the Applied Bioscience HND you must attain all of the mandatory Units (192 SCQF credit points/24 SQA credits), plus optional Units worth 48 SCQF credit points/6 SQA credits.

The HND normally extends over two years of full-time study, but can be taken on a part-time basis. It is delivered by means of lectures, practical and laboratory classes, tutorials, and industrial visits. After a first year foundation in a range of biological sciences and training in practical, experimental and laboratory techniques, you will further develop your knowledge and skills in DNA molecular technology and immunology, and learn about the applications of bioscience in the land-based sector.

Throughout the HND you will have the opportunity to further develop your awareness of business management and the Core Skills of *Communication*, *Numeracy, Information Technology*, *Problem Solving* and *Working with Others*. The inclusion of a broad range of options, including plant science and animal science optional Units, allows the development of abilities and interests leading to preferred progression or career paths.

Assessment strategy

Assessments may include tests, practical assessments, assignments, reports and projects. The overall assessment strategy is to encourage a holistic approach to assessment.

Graded Units

You will be required to carry out an investigation in which you can further develop and apply the knowledge, understanding and practical skills that you have developed throughout the first year of your studies. This Graded Unit is at SCQF level 7 and is worth 1 credit. It is designed to assess and grade your ability to undertake planning, research, evaluation and scientific report writing in the field of Bioscience.

During the second year you will be required to take two Graded Units at SCQF level 8, each worth 1 credit. One will be a three hour examination, to assess and grade your ability to retain and integrate your knowledge and understanding. The other will be an investigation to develop and assess your ability to apply your knowledge, understanding and practical skills to research a particular topic. This will involve planning, development, evaluation and scientific report writing for the investigation.

Employment opportunities

The Applied Bioscience HND may provide opportunities for you to enter employment pathways, potentially leading to positions such as:

- Laboratory technician
- Animal technician
- Quality control officer
- Grain quality / creamery technician
- Technical representative

Progression routes to Higher Education

HND Applied Bioscience is designed to articulate with year 3 of BSc Applied Bioscience, or BSc Applied Animal Science, according to choice of second year optional Units. These articulation routes may allow you to enter a much wider range of possible career pathways, such as:

- Research assistant (eg animal welfare, avian science, molecular biology)
- Plant pathologist
- Diagnostics consultant
- Media production manager (tissue culture)
- Production controller (Pharmaceuticals)
- Veterinary research assistant
- Animal Health Officer
- Pharmaceuticals sales executive
- Livestock nutritionist
- Evaluation officer (genetics and breeding)

There are other progression routes to biological science courses at other Higher Education establishments which further broaden possible career pathways. You are advised to check any specific entry requirements with the appropriate university admissions departments at an early stage of your HND studies.

Agricultural Science HND

The **Agricultural Science HND** has been designed to meet the technical and scientific requirements of today's agricultural sector. It aims to develop candidates' knowledge, understanding and skills in the science underpinning and supporting the agricultural industry, together with an understanding of the economic, environmental and ethical context in which the agricultural sector operates, in order to prepare candidates for degree level studies or for employment at technical or supervisory level in this sector.

Conditions for the award of Agricultural Science HND

For you to achieve the Agricultural Science HND, you must attain all of the mandatory Units (216 SCQF credit points/27 SQA credits), plus optional Units worth 24 SCQF credit points/3 SQA credits.

The HND normally extends over two years of full-time study, but can be taken on a part-time basis. It is delivered by means of lectures, practical and laboratory classes, tutorials, farm and industrial visits. In addition to a foundation in a range of biological sciences and training in practical, experimental and laboratory techniques, you will learn about the latest systems for crop and livestock production as well as the environmental and animal welfare issues that are becoming increasingly important in the agricultural sector. Throughout the HND you will have the opportunity to further develop your understanding of business management and the Core Skills of *Communication, Numeracy, Information Technology, Problem Solving* and *Working with Others.* The inclusion of a broad range of optional subjects, including farm scale renewable energy, wildlife management and the processing and quality of agricultural produce, allows the development of abilities and interests leading to preferred progression or career paths.

Assessment strategy

Assessments may include tests, practical assessments, assignments, reports and projects. The overall assessment strategy is to encourage a holistic approach to assessment.

Graded Units

You will be required to carry out an investigation in which you will further develop and apply the knowledge, understanding and practical skills that you have developed throughout the first year of your studies. This Graded Unit is at SCQF level 7 and is worth 1 credit. It is designed to assess and grade your ability to undertake planning, research, evaluation and scientific report writing in the field of Bioscience.

During the second year you will be required to take two Graded Units at SCQF level 8, each worth 1 credit. One will be a three hour examination, to assess and grade your ability to retain and integrate your knowledge and understanding.

The other will be a case study simulating the situation faced by a technical advisor called to a farm to investigate and solve a serious technical problem. This case study will develop and assess your ability to gather, analyse and interpret information and to apply your knowledge and understanding to solve problems and make recommendations for further actions and solutions. It will involve planning, development and evaluation of the scenario, after which you will be asked to produce a concise, well-presented technical report in a form which would be easily understood by a farm manager.

Employment opportunities

The Agricultural Science HND may provide opportunities for you to enter employment pathways, potentially leading to positions such as:

- Field technician
- Crop trials assistant
- Agricultural officer
- Animal welfare officer
- Technical representative for agricultural supply industries (feeds, seeds, silage additives, animal health products, semen)

Progression routes to Higher Education

Agricultural Science HND is designed to articulate with year 3 of BSc Agricultural Science. This articulation route may provide opportunities for you to enter the above jobs at a higher level, and will also open up a much wider range of possible career pathways, such as:

- Farm conservation adviser (FWAG)
- Trainee agricultural consultant (SAC)
- Field trials manager
- Assistant farm business manager
- Crop consultant
- Ruminant nutritionist

There are other progression routes to related courses at other Higher Education establishments which further broaden possible career pathways. You are advised to check any specific entry requirements with the appropriate university admissions departments at an early stage of your HND studies.

Green Technology HND

The revised **Green Technology HND** has been designed to meet an employment sector that is emerging as governments and industries work to address the issue of climate change. It aims to provide you with relevant technical and scientific knowledge, understanding and skills for the development and use of sustainable technologies and renewable resources in rural areas, in order to prepare you for degree level studies or for employment at technical or supervisory level in this sector.

Conditions for the award of HND Green Technology

For you to achieve the Green Technology HND, you must attain all of the mandatory Units (216 SCQF credit points/27 SQA credits) plus optional Units worth 24 SCQF credit points/3 SQA credits.

The HND normally extends over two years of full-time study, but can be taken on a part-time basis. It is delivered by means of lectures, practical and laboratory classes, tutorials, farm and industrial visits. You will be equipped with a foundation in relevant sciences together with training in practical, workshop, experimental and laboratory methods. After exploring today's pressing environmental issues, studies will focus on energy efficiency, small scale renewable energy systems, pollution and waste management, green building technologies and the production and processing of crops for biofuels and raw materials for industry. Throughout the HND you will have the opportunity to further develop your understanding of business management and the Core Skills of Communication, Numeracy, Information Technology, Problem Solving and Working with Others. The inclusion of optional subjects allows the development of abilities and interests leading to preferred progression or career paths.

Assessment strategy

Assessments may include tests, practical assessments, assignments, reports and projects. The overall assessment strategy is to encourage a holistic approach to assessment.

Graded Units

You will be required to carry out an investigation in which you will further develop and apply the knowledge, understanding and practical skills that you have developed throughout the first year of your studies. This Graded Unit is at SCQF level 7 and is worth 1 credit. It is designed to assess and grade your ability to undertake planning, research, evaluation and scientific report writing in the field of Bioscience.

During the second year you will be required to take two Graded Units at SCQF level 8, each worth 1 credit. One will be a three hour examination, to assess and grade your ability to retain and integrate your knowledge and understanding.

The other will be a case study, in which you might be asked to prepare a development plan for a given site to reduce its environmental impact, perhaps including the establishment of a renewable energy scheme. This case study will develop and assess your ability to gather, analyse and interpret information and to apply your knowledge, understanding and skills to solve problems and develop plans. You will be encouraged to complete an activity log or to keep a diary of the progress and tasks completed, so that you can evaluate progress and complete the exercise with a businesslike approach.

Employment opportunities

The Green Technology HND may allow opportunities for you to enter employment pathways, potentially leading to positions such as:

- Energy audit officer
- Waste audit officer
- Waste management technician
- Environmental project officer
- Community liaison officer (utility company)
- Technical representative (renewable energy company)
- Crop trials technician

Progression routes to Higher Education

The Green Technology HND is designed to articulate with year 3 of BSc Green Technology. This articulation route may allow opportunities for you to enter the jobs above at a higher level, and may also open up a much wider range of possible career pathways, such as:

- Energy development officer
- Environmental consultant
- Environmental technology project manager
- Waste management officer
- Specialised crops trials manager
- Plant product development researcher
- Carbon management consultant
- Carbon logistics specialist
- Energy account manager

There may be other progression routes to related courses at other Higher Education establishments which further broaden possible career pathways. You are advised to check any specific entry requirements with the appropriate university admissions departments at an early stage of your HND studies.

9 Glossary of terms

SCQF: This stands for the Scottish Credit and Qualification Framework, which is a new way of speaking about qualifications and how they inter-relate. We use SCQF terminology throughout this guide to refer to credits and levels. For further information on the SCQF visit the SCQF website at **www.scqf.org.uk**

SCQF credit points: One HN credit is equivalent to 8 SCQF credit points. This applies to all HN Units, irrespective of their level.

SCQF levels: The SCQF covers 12 levels of learning. HN Units will normally be at levels 6–9. Graded Units will be at level 7 and 8.

Subject Unit: Subject Units contain vocational/subject content and are designed to test a specific set of knowledge and skills.

Graded Unit: Graded Units assess candidates' ability to integrate what they have learned while working towards the Units of the Group Award. Their purpose is to add value to the Group Award, making it more than the sum of its parts, and to encourage candidates to retain and adapt their skills and knowledge.

Dedicated Core Skill Unit: This is a Unit that is written to cover one or more particular Core Skills, eg HN Units in Information Technology or Communications.

Embedded Core Skills: This is where the development of a Core Skill is incorporated into the Unit and where the Unit assessment also covers the requirements of Core Skill assessment at a particular level.

Signposted Core Skills: This refers to the opportunities to develop a particular Core Skill at a specified level that lie outwith automatic certification.

Qualification Design Team: The QDT works in conjunction with a Qualification Manager/Development Manager to steer the development of the HNC/D from its inception/revision through to validation. The group is made up of key stakeholders representing the interests of centres, employers, universities and other relevant organisations.

Consortium-devised HNCs and HNDs are those developments or revisions undertaken by a group of centres in partnership with SQA.

Specialist single centre and specialist collaborative devised HNCs and HNDs are those developments or revisions led by a single centre or small group of centres who provide knowledge and skills in a specialist area. Like consortium-devised HNCs and HNDs, these developments or revisions will also be supported by SQA.

10 Appendices

Appendix 1: Mapping of aims to Units
Appendix 2: Mapping of Units to National Occupational Standards
Appendix 3: Core Skills development
Appendix 4: Guidelines for timetabling mandatory Units

Appendix 1: Mapping of aims to Units

(a) HNC Bioscience: map of aims to Units

1 Develop study and research skills in the area of bioscience.
2 Develop transferable skills including the Core Skills.
3 Develop candidates' ability to undertake planning, development, synthesis and evaluation in the area of bioscience.
4 Enable candidates' progression within the SCQF framework to HND level study.
5 Develop candidates' employment skills and enhance candidates' employment prospects, by providing the candidate with a wide range of practical and laboratory skills and an awareness of safe working practices and health and safety issues.
6 Provide a candidate-centred learning ethos which stimulates candidates to achieve their full intellectual potential and to develop independence of thought and an enquiring mind.
7 Develop candidates' fundamental knowledge and understanding of cell biology, microbiology, biochemistry and environmental issues.
8 Enable candidates to develop a range of scientific and practical laboratory skills used by the bioscience industries.
9 Provide options to permit an element of vocational specialisation in areas of animal science, plant science, soil science, biotechnology, and the production of crops for food or energy generation.
10 Prepare candidates for employment at a junior technical or support level in bioscience industries.
11 Prepare candidates for HND and degree programmes in bioscience, including programmes in applied bioscience, agricultural science, applied animal science, green technology and related areas.

Year 1 (mandatory Units in bold) **Aims:**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Biochemistry: Theory & Practice	√	√	√	√	√	√	√	√		√	√
Cell Biology Theory & Practice	√	√		√	√	√	√	√		√	√
Environmental Awareness	√	√		√		√	√			√	√
Microorganisms: Growth, Activity and Significance	√	√	√	√	√	√	√	√		√	√
Quality & Health and Safety Systems in Science Industries		√		√	√	√		√		√	√
Information Technology Applications Software 1		√		√		√				√	√
HNC Biosciences Graded Unit - project	√	√	√	√	√	√	√	√		√	√
Plants: Growth and Development	√	√		√	√	√	√	√	√	√	√
Plants: Physiology	√	√		√	√	√	√		√	√	√
Chemistry and Physics for the Life Sciences	√	√		√	√	√	√			√	√
Livestock Physiology	√	√		√	√	√	√		√	√	√
Livestock Breeding	√	√		√		√	√		√	√	√
Livestock Growth, Health and Welfare	√	√		√	√	√	√		√	√	√
Biotechnology: An Introduction	√	√		√	√	√	√	√	√	√	√
Soils and Crop Establishment		√		√	√	√			√	√	√
Arable Crop Production		√		√	√	√			√	√	√
Crop Protection and Harvesting Mechanisation		√		√	√	√			√	√	√
Farm Power		√		√	√	√			√	√	√
Animal and Plant Cell Culture: An Introduction	√	√	√	√	√	√	√	√	√	√	√
Electrical Energy and Power Engineering: An Introduction		√		√	√	√			√	√	√
Personal Development Planning		√		√		√			√	√	√

(b) HND Applied Bioscience: mapping of aims to Units Year 1

1 Develop study and research skills in the area of bioscience
2 Develop transferable skills including the Core Skills.
3 Develop candidates' ability to undertake planning, development, synthesis and evaluation in the area of biological sciences for the land-based sector.
4 Enable candidates' progression within the SCQF framework to degree level study.
5 Develop candidates' employment skills and enhance candidates' employment prospects, by providing the candidate with a wide range of practical and laboratory skills and an awareness of safe working practices and health and safety issues.
6 Provide a candidate-centred learning ethos which stimulates students to achieve their full intellectual potential & to develop independence of thought & an enquiring mind.
7 Provide the candidate with a deeper underpinning knowledge of the biological and physical sciences relevant to the land-based industries.
8 Develop the candidates' knowledge and understanding of the applications of biological science and technology in the land-based industries and the environmental sector.
9 Develop scientific and practical laboratory skills, particularly in immunotechnology and DNA molecular technology.
10 Develop knowledge and understanding of ecological and environmental issues.
11 Develop options to permit an element of vocational specialisation in areas of applied crop science, applied animal science or environmental science.
12 Prepare candidates for progression to degree level study in Applied Bioscience and Applied Animal Science.
13 Prepare candidates for employment at a technical, supervisory or professional level in the land-based bioscience and biotechnology industries and for further vocational training in those industries.

Year 1 Units **Aims:**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Animal and Plant Cell Culture: An Introduction	√	√	√	√	√	√	√	√	√			√	√
Biochemistry: Theory & Practice	√	√	√	√	√	√	√		√			√	√
Biotechnology: An Introduction	√	√		√	√	√	√	√	√	√		√	√
Cell Biology Theory & Practice	√	√		√	√	√	√		√			√	√
Chemistry and Physics for the Life Sciences	√	√		√	√	√	√		√			√	√
Environmental Awareness	√	√		√		√	√	√		√		√	√
Information Technology Applications Software 1		√		√		√						√	√
Livestock Breeding	√	√		√		√	√	√				√	√
Livestock Growth, Health and Welfare	√	√		√		√	√	√				√	√
Livestock Physiology	√	√		√		√	√	√				√	√
Microorganisms: Growth, Activity and Significance	√	√	√	√	√	√	√	√	√	√		√	√
Plants: Growth and Development	√	√		√	√	√	√	√	√			√	√
Plants: Physiology	√	√		√		√	√	√		√		√	√
Quality & Health and Safety Systems in Science Industries		√		√	√	√			√			√	√
HNC Biosciences Graded Unit - project	√	√	√	√	√	√	√	√	√			√	√

HND Applied Bioscience: mapping of aims to Units Year 2

1 Develop study and research skills in the area of biological sciences for the land-based sector.
2 Develop transferable skills including the Core Skills to be demonstrated across all units.
3 Develop candidates' ability to undertake planning, development, synthesis and evaluation in the area of biological sciences for the land-based sector.
4 Enable candidates' progression within the SCQF framework to degree level study.
5 Develop candidates' employment skills and enhance candidates' employment prospects, by providing the candidate with a wide range of practical and laboratory skills and an awareness of safe working practices and health and safety issues.
6 Provide a student-centred learning ethos which stimulates students to achieve their full intellectual potential & to develop independence of thought & an enquiring mind.
7 Provide the candidate with a deeper underpinning knowledge of the biological and physical sciences relevant to the land-based industries.
8 Develop the candidates' knowledge and understanding of the applications of biological science and technology in the land-based industries and the environmental sector.
9 Develop scientific and practical laboratory skills, particularly in immunotechnology and DNA molecular technology.
10 Develop knowledge and understanding of ecological and environmental issues.
11 Develop options to permit an element of vocational specialisation in areas of applied crop science, applied animal science or environmental science.
12 Prepare candidates for progression to degree level study in Applied Bioscience and Applied Animal Science.
13 Prepare candidates for employment at a technical, supervisory or professional level in the land-based bioscience and biotechnology industries and for further vocational training in those industries.

Year 2 Units - mandatory units in bold **Aims:**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
DNA Molecular Techniques: Theory and Practice	√	√		√	√	√	√	√	√			√	√
Immunotechnology: Theory and Practice	√	√		√	√	√	√	√	√			√	√
Livestock Nutrition	√	√		√		√	√	√				√	√
Agroecosystems: Energetic Efficiency	√	√		√		√	√	√		√		√	√
Statistics for Science 2		√		√	√	√						√	√
Business Management: An Introduction:		√		√		√						√	√
Graded Unit Level 8 (Examination)	√	√		√		√	√					√	√
Graded Unit Level 8 (Project)	√	√		√	√	√	√					√	√
Plant Protection	√	√		√	√	√	√	√	√		√	√	√
Biomass: Technologies for Energy and Bioproducts	√	√		√	√	√	√	√	√	√	√	√	√
Crop Physiology and Breeding	√	√		√		√	√	√			√	√	√
Livestock Health: Approaches to Disease Control	√	√		√		√	√	√			√	√	√
Livestock Production Systems	√	√		√	√	√	√	√	√		√	√	√
Grass and Fodder Crop Production	√	√		√	√	√	√	√			√	√	√
Plant Protection: Integrated Approaches	√	√	√	√	√	√	√	√	√	√	√	√	√
Soils and Plant Nutrition	√	√		√		√	√	√		√	√	√	√
Pollution and Waste Management: An Introduction		√		√		√	√	√		√	√	√	√
Ecology and Ecosystems	√	√	√	√	√	√	√	√	√	√	√	√	√
Terrestrial Ecosystems	√	√	√	√	√	√	√	√	√	√	√	√	√
Personal Development Planning		√		√		√						√	√
Work Experience		√		√		√							√

(c) HND Agricultural Science Year 1: map of aims to Units

1 Develop study and research skills in the area of agricultural science.
2 Develop transferable skills including the Core Skills.
3 Develop candidates' ability to undertake planning, development, synthesis and evaluation in the area of agricultural science.
4 Enable candidates' progression within the SCQF framework to degree level study.
5 Develop candidates' employment skills and enhance candidates' employment prospects, by providing the candidate with a wide range of practical, laboratory, scientific and technical skills and an awareness of safe working practices, health and safety issues and business management.
6 To provide a student-centred learning ethos which stimulates students to achieve their full intellectual potential and to develop independence of thought and an enquiring mind.
7 Provide the candidate with a deeper underpinning knowledge and understanding of the biological and physical sciences of relevance to the agricultural industry.
8 Develop candidates' knowledge and understanding of the applications of scientific principles and techniques to support the agricultural industry.
9 Develop a range of scientific, technical and practical laboratory skills used by the agricultural industry.
10 Develop candidates' knowledge and understanding of crop and livestock production systems, their management and the economic, environmental, regulatory and animal welfare issues that influence these sectors.
11 Develop options to permit an element of vocational specialisation in areas of farm scale renewable energy generation, wildlife management, biotechnology or the quality and processing of agricultural produce.
12 Prepare candidates for employment at a technical or supervisory level with the agricultural supply and support industries, as well as government departments, environmental agencies and regulatory bodies dealing with agricultural issues.
13 Prepare candidates for progression to degree level study in Agricultural Science.

Year 1 Units: **Aims:**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Arable Crop Production	√	√	√	√	√	√		√	√	√		√	√
Biochemistry: Theory & Practice	√	√	√	√	√	√	√		√			√	√
Cell Biology Theory & Practice	√	√		√	√	√	√		√			√	√
Chemistry and Physics for the Life Sciences	√	√		√	√	√	√		√			√	√
Environmental Awareness	√	√		√		√				√		√	√
Information Technology Applications Software 1	√	√		√	√	√						√	√
Livestock Breeding	√	√		√		√	√	√		√		√	√
Livestock Growth, Health and Welfare	√	√		√		√	√	√				√	√
Livestock Physiology	√	√		√		√	√	√				√	√
Microorganisms: Growth, Activity and Significance	√	√	√	√	√	√	√	√	√			√	√
Plants: Growth and Development	√	√		√	√	√	√	√	√			√	√
Plants: Physiology	√	√		√		√	√	√				√	√
Quality & Health and Safety Systems in Science Industries	√	√		√	√	√			√			√	√
Soils and Crop Establishment	√	√		√		√		√	√	√		√	√
Graded Unit: HNC Biosciences Project	√	√	√	√	√	√		√	√			√	√

HND Agricultural Science Year 2: map of aims to Units

1 Develop study and research skills in the area of agricultural science.
2 Develop transferable skills including the Core Skills.
3 Develop candidates' ability to undertake planning, development, synthesis and evaluation in the area of agricultural science.
4 Enable candidates' progression within the SCQF framework to degree level study.
5 Develop candidates' employment skills and enhance candidates' employment prospects, by providing the candidate with a wide range of practical, laboratory, scientific and technical skills and an awareness of safe working practices, health and safety issues and business management.
6 To provide a student-centred learning ethos which stimulates students to achieve their full intellectual potential and to develop independence of thought and an enquiring mind.
7 Provide the candidate with a deeper underpinning knowledge and understanding of the biological and physical sciences of relevance to the agricultural industry.
8 Develop candidates' knowledge and understanding of the applications of scientific principles and techniques to support the agricultural industry.
9 Develop a range of scientific, technical and practical laboratory skills used by the agricultural industry.
10 Develop candidates' knowledge and understanding of crop and livestock production systems, their management and the economic, environmental, regulatory and animal welfare issues that influence these sectors.
11 Develop options to permit an element of vocational specialisation in areas of farm scale renewable energy generation, wildlife management, biotechnology or the quality and processing of agricultural produce.
12 Prepare candidates for employment at a technical or supervisory level with the agricultural supply and support industries, as well as government departments, environmental agencies and regulatory bodies dealing with agricultural issues.
13 Prepare candidates for progression to degree level study in Agricultural Science.

Year 2 Units **Aims**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Statistics for Science 2	√	√		√	√	√		√	√			√	√
Land Use Systems	√	√	√	√	√	√	√			√		√	√
Agroecosystems: Energetic Efficiency	√	√		√		√	√	√				√	√
Soils and Plant Nutrition	√	√		√		√	√	√				√	√
Plant Protection	√	√		√	√	√	√	√	√	√		√	√
Livestock Production Systems	√	√		√	√	√		√	√	√		√	√
Livestock Nutrition	√	√		√		√	√	√		√		√	√
Grass and Fodder Crop Production	√	√		√		√		√	√	√		√	√
Farm Manures, Wastes and the Environment	√	√	√	√	√	√	√	√		√		√	√
Business Management: An Introduction		√		√	√	√				√		√	√
Graded Unit Level 8 (Examination)	√	√		√		√		√				√	√
Graded Unit Level 8 (Project)	√	√		√	√	√		√				√	√
Biotechnology: An Introduction	√	√		√	√	√	√	√	√		√	√	√
Agricultural Produce: Quality and Processing	√	√		√		√		√			√	√	√
Livestock Health: Approaches to Disease Control	√	√		√		√	√	√		√		√	√
Crop Physiology and Breeding	√	√	√	√		√	√	√				√	√
Plant Protection: Integrated Approaches	√	√	√	√	√	√	√	√	√	√		√	√
Farm Scale Renewable Energy	√	√	√	√	√	√	√	√		√	√	√	√
Specialised Field Crops	√	√		√		√		√				√	√
Wildlife Management	√	√		√	√	√	√	√			√	√	√
Personal Development Planning		√		√		√						√	√
Work Experience		√		√		√							√

(d) HND Green Technology Year 1: map of aims to Units

1 Develop study and research skills in the area of renewable resources and sustainable technologies for rural areas.
2 Develop transferable skills including the Core Skills.
3 Develop candidates' ability to undertake planning, development, synthesis and evaluation in the area of renewable resources and sustainable technologies for rural areas.
4 Enable candidates' progression within the SCQF framework to degree level study.
5 Develop candidates' employment skills and enhance candidates' employment prospects, by providing the candidate with a wide range of practical, laboratory, scientific and technical skills and an awareness of safe working practices, health and safety issues and business management.
6 Provide a student-centred learning ethos which stimulates students to achieve their full intellectual potential and to develop independence of thought and an enquiring mind.
7 Provide the candidate with a deeper underpinning knowledge and understanding of the physical and biological sciences.
8 Develop candidates' knowledge and understanding of the application of physical and biological sciences to the development and use of sustainable technologies and renewable resources in rural areas.
9 Develop a range of scientific, technical and practical laboratory skills relating to the development and use of sustainable technologies and renewable resources in rural areas.
10 Develop candidates' knowledge and understanding of the environmental issues, economic considerations and regulatory factors that influence the development and use of sustainable technologies and renewable resources in rural areas.
11 Develop options to permit an element of vocational specialisation in areas of renewable energy generation, environmental building technologies, plant breeding, crop production and biotechnology.
12 Prepare candidates for employment at a technical or supervisory level with companies working in the areas of renewable energy, specialised plant products, crop breeding, pollution control and waste management or with environmental organisations and government departments.
13 Prepare candidates for progression to degree level study in Green Technology.

Year 1 Units- mandatory units are in bold **Aims:**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Arable Crop Production	√	√	√	√	√	√			√			√	√
Biochemistry: Theory & Practice	√	√		√	√	√	√		√			√	√
Cell Biology Theory & Practice	√	√		√	√	√	√					√	√
Chemistry and Physics for the Life Sciences	√	√		√	√	√	√		√			√	√
Crop Protection and Harvesting Mechanisation	√	√		√	√	√	√		√			√	√
Electrical Energy and Power Electronics	√	√		√	√	√	√	√	√			√	√
Environmental Awareness	√	√		√		√				√		√	√
Farm Power	√	√		√	√	√	√		√			√	√
Information Technology Applications Software 1		√		√		√						√	√
Microorganisms: Growth, Activity and Significance	√	√	√	√	√	√	√	√	√			√	√
Plants: Growth and Development	√	√		√	√	√	√					√	√
Plants: Physiology	√	√		√		√	√					√	√
Quality & Health and Safety Systems in Science Industries	√	√		√	√	√						√	√
Soils and Crop Establishment	√	√		√	√	√	√		√			√	√
Bioscience Graded Unit 1: Investigation	√	√	√	√	√	√	√					√	√

HND Green Technology: map of aims to Units Year 2

1 Develop study and research skills in the area of renewable resources and sustainable technologies for rural areas.
2 Develop transferable skills including the Core Skills.
3 Develop candidates' ability to undertake planning, development, synthesis and evaluation in the area of renewable resources and sustainable technologies for rural areas.
4 Enable candidates' progression within the SCQF framework to degree level study.
5 Develop candidates' employment skills and enhance candidates' employment prospects, by providing the candidate with a wide range of practical, laboratory, scientific and technical skills and an awareness of safe working practices, health and safety issues and business management.
6 Provide a student-centred learning ethos which stimulates students to achieve their full intellectual potential and to develop independence of thought and an enquiring mind.
7 Provide the candidate with a deeper underpinning knowledge and understanding of the physical and biological sciences.
8 Develop candidates' knowledge and understanding of the application of physical and biological sciences to the development and use of sustainable technologies and renewable resources in rural areas.
9 Develop a range of scientific, technical and practical laboratory skills relating to the development and use of sustainable technologies and renewable resources in rural areas.
10 Develop candidates' knowledge and understanding of the environmental issues, economic considerations and regulatory factors that influence the development and use of sustainable technologies and renewable resources in rural areas.
11 Develop options to permit an element of vocational specialisation in areas of renewable energy generation, environmental building technologies, plant breeding, crop production and biotechnology.
12 Prepare candidates for employment at a technical or supervisory level with companies working in the areas of renewable energy, specialised plant products, crop breeding, pollution control and waste management or with environmental organisations and government departments.
13 Prepare candidates for progression to degree level study in Green Technology.

Year 2 Units	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Renewable Energy: Microgeneration Systems	√	√	√	√	√	√	√	√	√	√		√	√
Farm Scale Renewable Energy	√	√	√	√	√	√	√	√	√	√		√	√
Energy Performance of Buildings	√	√	√	√	√	√	√	√	√			√	√
Land Use Systems	√	√	√	√	√	√	√	√	√	√		√	√
Agroecosystems: Energetic Efficiency	√	√		√		√	√	√		√		√	√
Biomass: Technologies for Energy and Bioproducts	√	√		√	√	√	√	√	√	√		√	√
Pollution and Waste Management: An Introduction	√	√		√		√	√	√		√		√	√
Transport Towards a Sustainable Future	√	√		√		√	√	√		√		√	√
Statistics for Science 2	√	√		√	√	√						√	√
Business Management: An Introduction:		√		√	√	√						√	√
Graded Unit Level 8 (Examination)	√	√		√		√						√	√
Graded Unit Level 8 (Project)	√	√	√	√	√	√		√	√	√		√	√
Farm Buildings and Controlled Environments	√	√		√	√	√	√	√			√	√	√
Environmental and Countryside Regulation	√	√		√	√	√				√		√	√
Genetics for Plant Science	√	√		√		√	√				√	√	√
Biotechnology: An Introduction	√	√		√		√	√	√	√		√	√	√
Crop Physiology and Breeding	√	√		√		√	√				√	√	√
Plant Protection	√	√		√	√	√	√		√		√	√	√
Soils and Plant Nutrition	√	√		√		√	√				√	√	√
Business Law: An Introduction	√	√		√		√				√		√	√
Personal Development Planning	√	√		√		√						√	√
Work Experience	√	√										√	

Appendix 2: Mapping of Units to National Occupational Standards

Bioscience HNC, Applied Bioscience HND, Agricultural Science HND and Green Technology HND

The following Units have some element of commonality with the Occupational Standards listed

Year 1

Unit title	Equivalent Occupational Standards
Agricultural Produce: Quality and Processing	Monitor and maintain the storage of harvested crops (MFAGC13) Write technical reports (BS43)
Arable Crop Production	Prepare for planting and plant extensive crops (029NAGC5) Prepare, monitor and cultivate sites for planting crops (029NAGC5) Promote, monitor and maintain the healthy growth of extensive crops (029NAGC10) Plan, monitor and evaluate the management of crops, their transport and storage (029NCU147) Write technical reports (BS43)
Chemistry and Physics for the Life Sciences	Provide operational monitoring assistance (ND418) Assess ionising radiation risks (RP4) Radiation Protection - Identify and quantify radiation hazards in the workplace (No ID available)
Crop Protection and Harvesting Mechanisation	O29NCU110 Plan and Manage the Control of Weeds, Pests and Diseases MFAGC12 Control the Harvesting of Extensive Crops by Mechanical Means
Electrical Energy and Power Electronics	Application of Electrotechnical Technology (ETPM201)
Environmental Awareness	Implement environmental good practice at work. (EC19)
Farm Power	Establish and Meet Customer's Technical Requirements for Tractors and Machinery (LBSE10) Transport Supplies of Physical resources within the Work Area (O29NCU8) Prepare and Operate a Tractor with Attachments (O29NAGCCU11)
Information Technology Applications Software 1	Operate a Computer Level 2 (OPU2) Presentation Software Level 2 (PS2) Spreadsheet Software Level 3 (SS3) Word Processing Software Level 3 (WP3) Use IT to Exchange Information Level 2 (UEI3) Use IT Systems Level 3 (UIT3) Email Level 2 (MAIL2) Use IT Systems and Software (CICF34)

Unit title	Equivalent Occupational Standards
Livestock Growth, Health and Welfare	Ensure health and welfare of livestock (LD2.2) Maintain site biosecurity and personal hygiene (MFLP6) Establish, monitor and maintain conditions appropriate to welfare of livestock (MFLP24). Establish, monitor and maintain site hygiene and biosecurity (MFLP26)
Quality & Health and Safety Systems in Science Industries	Implement quality assurance systems OPDA56
Soils and Crop Establishment	Promote, monitor and maintain the healthy growth of extensive crops. (O29NAGC10) Ameliorate soil under mature trees (TT33) Assist with planting and establishing plants (HOCU61) Prepare growing media (O29NAHCU74) Prepare and cultivate sites for planting extensive crops (O29NAGC4) Prepare, monitor and cultivate sites for planting crops (029NAGC5)

Year 2

Unit title	Equivalent Occupational Standards
DNA Molecular Techniques: Theory and Practice	Writing Technical Reports (BS43)
Ecology and Ecosystems	Survey and report on the condition of the environment (EC2)
Energy Performance of Buildings	Provide Basic Energy Efficiency Advice (O12NVR455) Resolve Basic Energy Efficiency Problems (O12NVR454) Demonstrate Achievable Improvements in Energy Efficiency (O12NVR456)
Environmental and Countryside Regulation	Communication of Environmental Information (EC6)
Farm Buildings and Controlled Environments	Determine Policies for the Development of Land-based Sites (CU92) Plan, programme and monitor the development of land based sites (LBMCU95) Plan, monitor and evaluate the construction and maintenance of structures and surfaces (LBMCU26)
Farm Manures, Wastes and the Environment	Plan, Monitor and Evaluate the Disposal of Waste (MFLP37)
Farm Scale Renewable Energy	Evaluate Resources and Assess Environmental Impact (CICA23) Develop and test Project Design Solutions (CICB51)
Grass and Fodder Crop Production	Prepare for planting and plant extensive crops (029NAGC5) Monitor and maintain the healthy growth of extensive crops (O29NAGC6). Plan, monitor and evaluate the management of crops, their transport and storage (029NCU147) Monitor and maintain the storage of harvested crops. (O29NAGC13) Control the harvesting of extensive crops by mechanical means (O29NAGC12).
Land Use Systems	Negotiate Improvements in Land Use (EC28) Assess the characteristics of sites (LBMCU91) Negotiate improvements to land use (EC28)
Livestock Nutrition	Maintain, monitor and evaluate the provision of feed and water to livestock (MFLP27)
Livestock Production Systems	Provide feed and water to livestock (MFLP7) Assist with maintaining the healthy performance of livestock (MFLP5) Assist in establishing and maintaining conditions appropriate to the welfare of livestock production (MFLP4) Write technical reports (BS43)
Plant Protection: Integrated Approaches	Identify the presence of pests, diseases and disorders and assist with their control (PHCU 78) Plan and manage the control of pests, diseases and disorders (PHCU80)
Plant Protection	Assist with identifying the presence of, and controlling, common pests and diseases (HOCU70)
Pollution and Waste Management: An Introduction	Implement Environmental Good Practice at Work (EC19)
Renewable Energy: Microgeneration Systems	Provide Basic Energy Efficiency Advice (O12NVR455) Demonstrate Achievable Improvements in Energy Efficiency (O12NVR456)

Unit title	Equivalent Occupational Standards
Soils and Plant Nutrition	Promote, monitor and maintain the healthy growth of extensive crops. (O29NAGC10)
Specialised Field Crops	Set out and establish crops (PH2) Prepare for planting and plant extensive crops (029NAGC5) Prepare, monitor and cultivate sites for planting crops (029NAGC5) Promote, monitor and maintain the healthy growth of extensive crops (029NAGC10) Plan, monitor and evaluate the management of crops, their transport and storage (029NCU147) Monitor and maintain the growth and development of crops (PH3) Harvest and prepare intensive crops (PH4) Promote the growth and development of crops (PH5) Plan and maintain the production of plants by vegetative methods (PH9) Plan and manage propagation from seed (PH10) Plan and maintain the harvesting of intensive crops (PH11) Write technical reports (BS43)
Statistics for Science 2	Write technical reports (BS43)
Terrestrial Ecosystems	Prepare, conduct and report on field surveys (EC23)
Transport Towards a Sustainable Future	TP 3 Manage Transport Planning Projects TP 10 Apply Assessment Techniques in Transport Planning TP 12 Develop Strategic and Master Plans for Transport
Wildlife Management	Control vertebrate pest populations using chemical means (GACU 48) Control vertebrate pests and predators by shooting (GACU 47) Control vertebrate pests and predators using traps (GACU 46) Stalk and cull deer (GACU 19)

Appendix 3: Core Skills development

Bioscience HNC: Core Skills development

Units	**SCQF level of Core Skills Development** ***Signposted opportunities unless stated otherwise***				
Year 1 (mandatory Units in bold)	**Numeracy**	**Communication**	**Information Technology**	**Problem Solving**	**Working with others**
Biochemistry: Theory & Practice		**6**			
Cell Biology Theory & Practice					
Environmental Awareness		**6**	**6**	**6**	
Microorganisms: Growth, Activity and Significance	**6**	**6**		**5**	**5**
Quality & Health and Safety Systems in Science Industries		**6**			**5**
Information Technology Applications Software 1			**6 Embedded**		
Bioscience Graded Unit 1 - project	**5**	**5**	**6**	**5**	
Plant Growth and Development	6	6			
Plant Physiology	6				
Chemistry and Physics for the Life Sciences	6	6		6	
Livestock Physiology		6		6	
Livestock Breeding	6				
Livestock Growth, Health and Welfare		6	6		
Biotechnology: An Introduction	6	6		6	6
Soils and Crop Establishment		6		6	
Arable Crop Production	6	6		6	
Crop Protection and Harvesting Mechanisation		6		6	
Farm Power	6	6		6	
Animal and Plant Cell Culture: An Introduction		6		6	
Electrical Energy and Power Electronics: An Introduction	5				
Personal Development Planning					

Communication (SCQF level 6)

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 Valuate fully the effectiveness of a communication in meeting its purpose and needs of its intended readership.

Units	Knowledge and Skills/Evidence	Developed/ Assessed	a	b
Biochemistry: Theory & Practice	Outcomes 1, 2 and 3	Developed	√	√
Environmental Awareness	Outcomes 1, 2, 3 and 4	Developed	√	√
Microorganisms: Growth, Activity and Significance	Outcomes 2 and 3	Developed	√	
Quality & Health and Safety Systems in Science Industries	Outcome 1 and 2	Developed	√	√
Plant Growth and Development	Outcomes 1, 2 and 3	Developed	√	√
Chemistry and Physics for the Life Sciences	Outcomes 1,2 3 and 4	Developed	√	
Livestock Physiology	Outcome 1 and 3	Developed	√	√
Livestock Growth, Health and Welfare	Outcome 4	Developed	√	√
Biotechnology: An Introduction	Outcome 5	Developed	√	√
Soils and Crop Establishment	Outcomes 1, 2 3 and 4	Developed	√	
Arable Crop Production	Outcome 1	Developed	√	√
Crop Protection and Harvesting Mechanisation	Outcomes 1, 2 and 3	Developed	√	√
Farm Power	Outcomes 2 and 3	Developed	√	√
Animal and Plant Cell Culture: An Introduction	Outcomes 1 and 3	Developed	√	

Communication (SCQF level 6) *continued*

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.

Units	Knowledge and Skills/Evidence	Developed/ Assessed	a	b	c	d	e
Biochemistry: Theory & Practice	Outcomes 1, 2 and 3	Developed	√	√	√	√	√
Environmental Awareness	Outcomes 1, 2, 3 and 4	Developed	√	√	√	√	√
Microorganisms: Growth, Activity and Significance	Outcomes 1 and 2	Developed	√	√	√	√	√
Quality & Health and Safety Systems in Science Industries	Outcome 3	Developed	√	√	√	√	√
Plant Growth and Development	Outcomes 1, 2 and 3	Developed	√	√	√		
Chemistry and Physics for the Life Sciences	Outcome 3	Developed	√	√	√	√	
Livestock Physiology	Outcome 4	Developed	√	√	√	√	√
Livestock Growth, Health and Welfare	Outcome 4	Developed	√	√	√	√	√
Biotechnology: An Introduction	Outcome 4	Developed	√	√	√	√	√
Arable Crop Production	Outcome 2	Developed	√	√	√	√	√
Crop Protection and Harvesting Mechanisation	Outcome 3	Developed	√	√	√		
Farm Power	Outcome 3	Developed	√	√	√	√	
Animal and Plant Cell Culture: An Introduction	Outcomes 1, 2, 3 and 4	Developed	√	√	√	√	√

Communication (SCQF level 6) *continued*

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.

Units	Knowledge and Skills/Evidence	Developed/ Assessed	a	b	c	d	e
Environmental Awareness	Outcomes 1, 2, 3 and 4	Developed	√	√	√	√	
Quality & Health and Safety Systems in Science Industries	Outcome 3	Developed	√	√	√	√	√
Biotechnology: An Introduction	Outcome 5	Developed	√	√	√	√	√
Animal and Plant Cell Culture: An Introduction	Outcomes 2 and 4	Developed	√	√	√	√	
Arable Crop Production	Outcome 2	Developed	√	√	√	√	√

Using Information Technology (SCQF level 6)

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.

Units	**Knowledge and Skills/Evidence**	**Developed/ Assessed**	**a**	**b**	**c**	**d**
Information Technology Applications Software 1	Embedded in Unit	Assessed	√	√	√	√
Livestock Growth, Health and Welfare	Outcome 4	Developed			√	√
Environmental Awareness	Outcomes 1, 2 and 3	Developed				√

Numeracy (SCQF level 5)

Skill component: Using Number: Apply a wide range of numerical steps

a Work confidently with a numerical concept.
b Decide on numerical operations.
c Carry out complex or sustained calculations.

Units	Knowledge and Skills/Evidence	Developed/ Assessed	a	b	c
Electrical Energy and Power Electronics: An Introduction	Outcomes 1 2 and 3	Developed	√	√	√

Numeracy (SCQF level 6)

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.

Units	Knowledge and Skills/Evidence	Developed/ Assessed	a	b	c
Microorganisms: Growth, Activity and Significance	Outcomes 1 and 2	Developed	√	√	√
Plant Growth and Development	Outcome 1	Developed	√	√	√
Plant Physiology	Outcomes 2 and 3	Developed	√	√	√
Chemistry and Physics for the Life Sciences	Outcome 3	Developed	√	√	√
Livestock Breeding	Outcome 3	Developed	√	√	√
Biotechnology: An Introduction	Outcome 4	Developed	√	√	√
Arable Crop Production	Outcome 2	Developed	√	√	√
Farm Power	Outcomes 1 and 4	Developed	√	√	√

Numeracy (SCQF level 6) - *continued*

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.

Units	Knowledge and Skills/Evidence	Developed/ Assessed	a	b
Microorganisms: Growth, Activity and Significance	Outcome 2	Developed	√	√
Plant Growth and Development	Outcome 1	Developed	√	
Plant Physiology	Outcome 1	Developed	√	
Chemistry and Physics for the Life Sciences	Outcome 3	Developed	√	√
Livestock Breeding	Outcome 3	Developed	√	√
Biotechnology: An Introduction	Outcome 4	Developed		√
Arable Crop Production	Outcome 2	Developed	√	√
Farm Power	Outcome 2 and 4	Developed	√	

Problem Solving (SCQF level 5)

Skill components Critical Thinking: Analyse a non-routine problematic situation or issue

a Identify the most important influences affecting the problem.
b Explain the effects of these influences on the problem.
c Outline an approach to deal with the problem.

Units	Knowledge and Skills/Evidence	Developed/ Assessed	a	b	c
Microorganisms: Growth, Activity and Significance	Outcome 1	Developed	√	√	√

Skill components Planning and Organising: Plan, organise and carry out a task to tackle a problem

a Develop a plan.
b Identify and obtain resources needed for the task.
c Carry out the task.

Units	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c
Microorganisms: Growth, Activity and Significance	Outcomes 1 and 2	Developed	√	√	√

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

Units	Knowledge and Skills/Evidence	Developed/Assessed	a	b	c
Microorganisms: Growth, Activity and Significance	Outcomes 1 and 2	Developed	√	√	√

Problem Solving (SCQF level 6)

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.

Units	Knowledge and Skills/Evidence	Developed/ Assessed	a	b	c
Livestock Physiology	Outcome 4	Developed	√	√	√
Soils and Crop Establishment	Outcome 4	Developed	√	√	√
Arable Crop Production	Outcome 2	Developed	√	√	√
Crop Protection and Harvesting Mechanisation	Outcome 3	Developed	√	√	√
Animal and Plant Cell Culture: An Introduction	Outcomes 2 and 4	Developed	√	√	√
Environmental Awareness	Outcomes 1, 2, 3 and 4	Developed	√	√	√

Skill components Planning and Organising: Plan, organise and complete a very simple, familiar task.

a Identify some very simple steps in the plan.
b Select appropriate resources to carry out the plan.
c Carry out the task.

Units	Knowledge and Skills/Evidence	Developed/ Assessed	a	b	c
Cell Biology Theory & Practice	Outcome 3	Developed	√	√	√
Livestock Physiology	Outcome 4	Developed	√	√	√
Biotechnology: An Introduction	Outcome 4	Developed	√	√	√
Arable Crop Production	Outcome 2	Developed	√	√	√
Crop Protection and Harvesting Mechanisation	Outcome 3	Developed	√	√	√
Animal and Plant Cell Culture: An Introduction	Outcomes 2 and 4	Developed	√	√	√
Environmental Awareness	Outcomes 1, 2, 3 and 4	Developed	√	√	√

Problem Solving (SCQF level 6) (continued)

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.

Units	Knowledge and Skills/Evidence	Developed/ Assessed	a	b	c
Chemistry and Physics for the Life Sciences	Outcome 3	Developed	√	√	√
Biotechnology: An Introduction	Outcome 4	Developed	√	√	√
Animal and Plant Cell Culture: An Introduction	Outcomes 2 and 4	Developed	√	√	√
Environmental Awareness	Outcomes 1, 2, 3 and 4	Developed	√	√	√

Working with Others (SCQF level 5)

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.

Units	Knowledge and Skills/Evidence	Developed/ Assessed	a	b	c	d
Microorganisms: Growth, Activity and Significance	Outcome 2	Developed	√	√	√	
Quality & Health and Safety Systems in Science Industries	Outcome 3	Developed	√	√	√	

Working with Others (SCQF level 6)

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.

Units	Knowledge and Skills/Evidence	Developed/ Assessed	a	b	c	d	e
Biotechnology: An Introduction	Outcome 5	Developed	√	√	√	√	√

Appendix 4: Guidelines for timetabling mandatory Units

HNC Bioscience:		
Term 1	**Term 2**	**Term 3**
Cell Biology: Theory and Practice Or Cell Biology: Theory and Laboratory Skills	Biochemistry: Theory and Practice Or Biochemistry: Theory and Laboratory Skills	Optional Unit 3
Quality and Health and Safety Systems in Science Industries	Environmental Awareness	Optional Unit 4
Information Technology: Applications Software 1	Optional Unit 1	Optional Unit 5
Microorganisms: Growth Activity and Significance	Optional Unit 2	
	HNC Bioscience Graded Unit	HNC Bioscience Graded Unit

HND Applied Bioscience Year 2		
Term 1	**Term 2**	**Term 3**
DNA Molecular Techniques: Theory and Practice	DNA Molecular Techniques: Theory and Practice	Applied Bioscience Graded Unit 2
Immunotechnology: Theory and Practice	Agroecosystems: Energetic Efficiency	Applied Bioscience Graded Unit 3
Livestock Nutrition	Statistics for Science: 2	Business Management: An Introduction

HND Agricultural Science Year 2		
Term 1	**Term 2**	**Term 3**
Livestock Nutrition	Agroecosystems: Energetic Efficiency	Agricultural Science Graded Unit 2
Livestock Production Systems	Statistics for Science: 2	Agricultural Science Graded Unit 3
Soils and Crop Nutrition	Plant Protection	Business Management: An Introduction
Land Use Systems	Grass and Fodder Crop Production	
Farm Manures, Wastes and the Environment		

HND Green Technology Year 2		
Term 1	**Term 2**	**Term 3**
Biomass: Technologies for Energy and Bioproducts	Agroecosystems: Energetic Efficiency	Green Technology Graded Unit 2
Land Use Systems	Statistics for Science: 2	Green Technology Graded Unit 3
Farm Scale Renewable Energy	Renewable Energy: Microgeneration Systems	Business Management: An Introduction
Energy Performance of Buildings	Transport Towards a Sustainable Future	