



Arrangements for:

**Professional Development Award in
Laboratory Science at SCQF level 7**

Group Award Code: G9F0 47

Validation date: June 2009

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Acknowledgement

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of Professional Development Awards.

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.

Version number	Description	Date
05	Alternative units added to the optional section of the framework. Chemical Engineering: Principles (H97N 34) Chemical Engineering: Applied Physical Chemistry (H97L 34) Heat Transfer Theory and Practical Skills (H97T 34) Process Operations: Distillation (H97R 35)	28/08/17
04	Revision of Units: FA3J 34 Process Safety Engineering has been replaced by HE3F 34. F3XG 34 Process Operations: Heat Exchange, Drying and Evaporation has been replaced by HE3J 35. F3XB 34 Fluid Mechanics: Theory and Practice has been replaced by HE3E 34. F3XD 34 Industrial Chemicals: Processes and Products has been replaced by HE3G 34. All old units will finish 31/07/2018	02/06/16
03	Mandatory Units Fundamental Chemistry: Theory and Laboratory Skills (H92X 34) added as an alternative to Fundamental Chemistry: Theory and Practice (DH2K 34) Animal and Plant Cell Culture: An Introduction (H920 34) added as an alternative to Animal and Plant Cell Culture: An Introduction (DH2H 34) Animal Biology (H921 35) added as an alternative to Animal Biology (DP4L 34) Biochemistry: Theory and Laboratory Skills (H922 34) added as an alternative to Biochemistry: Theory and Practice (DH2J 34) Biotechnology: An Introduction (H926 34) added as an alternative to Biotechnology: An Introduction (DJ00 34) Cell Biology: Theory and Laboratory Skills (H927 34) added as an alternative to Cell Biology: Theory and Practice (DJ1K 34) Inorganic Chemistry: Theory and Laboratory Skills (H92Y 34) added as an alternative to Fundamental Concepts of Inorganic Chemistry (DP2N 34) Physical Chemistry: Theory and Laboratory Skills (H936 34) added as an alternative to Fundamental Concepts of Physical Chemistry (DP2R 34) Organic Chemistry: Theory and Laboratory Skills (H933 34) added as an alternative to Fundamental Concepts of Organic Chemistry (DP2P 34) Optional Units Aromatic Chemistry: Theory and Laboratory Skills (H92N 35) added as an alternative to Aromatic Chemistry (DP54 35)	15/09/15

Version number	Description	Date
	<p>Base-Catalysed and Organometallic Chemistry: Theory and Laboratory Skills (H92P 35) added as an alternative to Base-Catalysed Reactions and Organometallic Reagents on the Organic Synthesis (DP5W 35)</p> <p>DNA Molecular Techniques (H92A 35) added as an alternative to DNA Molecular Techniques: Theory and Practice (DJ6X 34)</p> <p>Electrochemistry (H92T 35) to be added as an alternative to Electrochemistry (DP5V 35)</p> <p>Immunological Techniques (H92E 35) to be added as an alternative to Immunological Techniques: Theory and Practice (DH2L 35)</p> <p>Instrumental Techniques 1 (H930 35) added as an alternative to Instrumental Techniques: Theory and Practice 1 (DH54 35)</p> <p>Instrumental Techniques 2 (H931 35) added as an alternative to Instrumental Techniques: Theory and Practice 2 (DH2N 35)</p> <p>Main Group Inorganic Chemistry (H932 35) added as an alternative to Main Group Inorganic Chemistry (DV9F 35)</p> <p>Organic Stereochemistry: Theory and Laboratory Skills (H934 35) added as an alternative to Organic Stereochemistry (DX2H 35)</p> <p>Phase Equilibrium and Surface Chemistry (H935 35) added as an alternative to Phase Equilibrium and Surface Chemistry (DP5X 35)</p> <p>Science Industry: Key Issues (H92K 34) added as an alternative to Science Industry: Key Issues (DP9M 34)</p> <p>Thermodynamics and Kinetics: Theory and Laboratory Skills (H938 35) added as an alternative to Thermodynamics and Kinetics (DP4N 35)</p> <p>Transition Metal Chemistry: Theory and Laboratory Skills (H939 35) added as an alternative to Transition Metal Chemistry (DR0E 35)</p>	
02	<p>Revision of Unit: DN8D 33 Mathematics for Science 1 has been revised by H8XP 33 Mathematics for Science 1 and will finish 31/07/2017</p>	July 2015
02	<p>Revision of Unit: DN8C 34 Statistics for Science 1 has been revised by H8XT 33 Statistics for Science 1 and will finish 31/07/2017</p>	July 2015
02	<p>Revision of Unit: DG6Y 34 Applied Biomedical Techniques has been revised by H91T 34 Applied Biomedical Techniques and will finish 31/07/2017</p>	July 2015
02	<p>Revision of Unit: DN37 34 Ecology and Ecosystems has been revised by H93A 34 Ecology and Ecosystems and will finish 31/07/2017</p>	July 2015
02	<p>Revision of Unit: DP4Y 34 Environmental Chemistry has been revised by H92V 35 Environmental Chemistry: Theory and Laboratory Skills and will finish 31/07/2017</p>	July 2015

Version number	Description	Date
02	Revision of Unit: DH55 34 Microbiology: Theory and Practice has been revised by H92G 34 Microbiology: Theory and Laboratory Skills and will finish 31/07/2017	July 2015
02	Revision of Unit: DP4M 34 Plant Biology been revised by H92H 35 Plant Biology and will finish 31/07/2017	July 2015
02	Revision of Unit: DP5T 35 Applications of Transition Metal Compounds been revised by H92M 35 Applications of Transition Metal Compounds and will finish 31/07/2017	July 2015
02	Revision of Unit: Statistics for Science 2 has been revised by H8XV 34 and will finish 31/07/2015	July 15
02	Revision of Unit: Mathematics for Science 2 has been revised by H8XR 34 and will finish 31/07/2015	July 15
02	Revision of Unit: DP4R 35 Biomedical Investigations been revised by H924 35 Biomedical Investigations and will finish 31/07/2017	July 2015
02	Revision of Unit: DN35 35 Biomedical Pathology been revised by H925 35 Biomedical Pathology and will finish 31/07/2017	July 2015
02	Revision of Unit: DP4T 35 Cellular Signalling been revised by H928 35 Cellular Signalling and will finish 31/07/2017	July 2015
02	Revision of Unit: DG71 35 Human Body Structure and Function been revised by H92C 35 Human Body Structure and Function and will finish 31/07/2017	July 2015
02	Revision of Unit: DN39 35 Human Metabolism been revised by H92D 35 Human Metabolism and will finish 31/07/2017	July 2015
02	Revision of Unit: DH2P 35 Microbiological Techniques: Theory and Practice been revised by H92F 35 Microbiological Techniques and will finish 31/07/2017	July 2015
02	Revision of Unit: DN33 33 Physics 1 been revised by H93D 33 Physics 1 and will finish 31/07/2017	July 2015
02	Revision of Unit: DG6X 35 Protein Structure and Function been revised by H92J 35 Protein Structure and Function and will finish 31/07/2017	July 2015

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1 Introduction

This is the Arrangements Document for the new Group Award in Laboratory Science, at SCQF level 7, which was validated in June 2009. This document includes: rationale for the development of the Group Award, its aims, guidance on access, details of the Group Award structure, and guidance on delivery.

The award title Professional Development Award in Laboratory Science, reflects the scientific nature of the award and is linked to the skills required to become competent to work in a laboratory environment. The general approach is to develop good technical, investigative and problem solving skills. Candidates for this award will be able to work in a broad range of companies; hence the title of the award is generic enough to reflect the diversity of the Science Industry in Scotland.

The award aims to provide underpinning knowledge to support the SVQ in Laboratory Science at level 3.

2 Rationale for the development of the Group Award

In recent years industry has expressed concern over the lack of availability of technically competent people to work in science laboratories. The science industry was finding that university graduates lacked the required skills, which meant that considerable effort had to be put into re-training graduates for the jobs. The second problem for many companies was that there was a high staff turnover. To address these issues SEMTA and the science industry developed a Modern Apprenticeship for technicians and technologists. This qualification is designed to underpin the vocational part of the Modern Apprenticeship. It will be available to those on the MA and for professional development of the existing workforce.

3 Aims of the Group Award

3.1 Principal aims of the Group Award

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

- ◆ **develop candidates' knowledge and skills** such as planning, analysis and laboratory techniques in the area of science.
- ◆ **develop employment prospects** enhancing candidates' underpinning knowledge to support a wide range of practical laboratory skills and technologies. Candidates will also become familiar with 'soft skills' such as learning to work on their own or in a team environment as well as developing skills in producing oral and written reports and enhancing their presentation and communication skills.
- ◆ **enable progression** within the SCQF framework to HNC/HNDs in Science.
- ◆ **develop study and research skills** in the area of science.

- ◆ **develop transferable skills** including Core Skills to be demonstrated across all Units including IT skills, statistics, presentation skills, working in a team and problem-solving.
- ◆ **develop in the candidate skills of independent study and communication** and an informal sense of the responsibility attached to the work of laboratory scientists.

3.2 General aims of the Group Award

- ◆ **prepare candidates for an appropriate level of employment**, in science areas such as research and industrial laboratories; biotechnology, chemical, microbiological, pharmaceutical, and environmental industries
- ◆ **develop a range of contemporary vocational skills** relating to the use, support and development of systems appropriate to employment at technician or professional level.
- ◆ **develop options to permit an element of vocational specialisation** in a variety of biological science areas in Units such as: immunology, microbiology, medicinal chemistry, biotechnology, animal biology, cell biology.
- ◆ **prepare candidates for progression to further studies** in science related disciplines.
- ◆ **provide a flexible route to a qualification**, meeting demand, for example, for those already in employment. The unitised structure of the course and the intended modes of delivery will provide access to this qualification from those in employment through day-release provision and for direct entry or seconded candidates through full-time provision. Discrete Units will also be available for study.
- ◆ **provide candidates with a wide range of practical laboratory skills** to further enhance job prospects through the practical content of the course

3.3 Target groups

The existing HN and NQ Sciences programmes are already popular in delivering colleges, and it is envisaged that the more flexible and industry tailored PDA programme will improve candidates' employment and progression prospects.

This course will be attractive to a diverse group of learners including those in employment, school leavers, adult returners and Modern Apprentices. It is thought that in the main learners will study on a part time basis and be in employment (possibly undertaking the Modern Apprenticeship).

The PDA is intended to act both as a vocational qualification to meet the workforce demands of the science industry and as an entry route to Higher Qualifications at Scottish Colleges and Universities, particularly those degrees and Higher National Qualifications covering areas of the sciences. Moreover, the intention is to work with relevant professional bodies to secure recognition for the PDA.

The PDA in Laboratory Science will support laboratory ‘technologists’ (those undertaking laboratory analysis and technical activities) and will be included in the Life Sciences level 3 Modern Apprenticeship. This Group Award is levelled at SCQF level 7.

Target audience

- ◆ School leavers
- ◆ Adult returners
- ◆ Graduates seeking ‘Technical Skills’
- ◆ Employed Laboratory Technicians/Technologists. (Lifesciences, NHS, Chemicals, Food and Drink etc)

4 Access to Group Award

It is intended that admission to this course should be as broad based as possible, but that this should be consistent with the selection of candidates who have a reasonable chance of successfully completing the course. In many cases candidates will already be working in a science laboratory as an apprentice or undertaking the course as part of their professional development. The following entry requirements are given as guidelines only:

- ◆ One Science Higher and no fewer than three Standard Grade 3/Intermediate 2 passes, including Chemistry, Biology, Biotechnology or Human Biology and Mathematics
- ◆ If candidates do not have chemistry at SCQF level 6 they should complete level 6 chemistry bridging Units initially as an integral component of their course
- ◆ NPA in Laboratory Science
- ◆ National Certificate at SCQF level 6
- ◆ National Qualification in an appropriate Science and Maths programme, such as SWAP Access to Science. Candidates should preferably possess some NQ Units at Higher level
- ◆ Qualifications comparable to the above, gained through other awarding bodies
- ◆ At the discretion of the Principal of the presenting centre for applicants with a different experiential background, who could benefit from taking the course or Units within the course, eg adult returners, overseas students with relevant qualifications and/or work experience

Alternative access arrangements

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

- ◆ Assessment on demand
- ◆ Credit transfer
- ◆ Accreditation of prior learning
- ◆ Relevant Work Experience eg science industries, medical and NHS laboratories

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

5 Group Award structure

The PDA comprises a combination of mandatory Units and options. Options will be selected in partnership with delivering colleges. The college must advise on the most appropriate Units to ensure:

- ◆ competence
- ◆ progression and articulation
- ◆ possible progression to HNC/HND
- ◆ employer needs

5.1 Framework

Candidates must complete a minimum of 8 credits

Each candidate must complete four mandatory Units. Candidates must then select a minimum of 1 credit from Section A. The remaining 3 credits can be selected from either Section A or Section B.

	Unit title	Number	Credit value	Level
MANDATORY (4 Credits)	Quality and Health and Safety Systems in Science Industries	DF82 34	1	7
	Fundamental Chemistry: Theory and Practice Or Fundamental Chemistry: Theory and Laboratory Skills	DH2K 34 H92X 34	2 2	7 7
	Mathematics for Science 1 OR Statistics for Science 1	H8XP 33* H8XT 33*	1 1	6 7
	Options Section A (1–4 Credits) Maximum	Animal and Plant Cell Culture: An Introduction Or Animal and Plant Cell Culture: An Introduction Or Animal Biology Or	DH2H 34 Or H920 34 DP4L 34 Or	1 1 1

	Unit title	Number	Credit value	Level
Options Section A	Animal Biology	H921 35	1	7
	Applied Biochemical Techniques	H91T 34*	1	7
	Biochemistry: Theory and Practice Or Biochemistry: Theory and Laboratory Skills	DH2J 34 Or H922 34	1 1	7 7
	Biotechnology: An Introduction Or Biotechnology: An Introduction	DJ00 34 Or H926 34	1 1	7 7
	Cell Biology: Theory and Practice Or Cell Biology: Theory and Laboratory Skills	DJ1K 34 Or H927 34	1 1	7 7
	Chemical Engineering Principles Or Chemical Engineering: Principles	F3X8 34 H97N 34*	 1	 7
	Chemical Engineering: Applied Physical Chemistry OR Chemical Engineering: Applied Physical Chemistry	F3X9 34 H97L 34*	 1	 7
	DNA Structure and Function	DJ6Y 34	1	7
	Earth Science	DN36 34	1	7
	Ecology and Ecosystems	H93A 34*	1	7
	Environmental Biology	D033 13	1	7
	Environmental Chemistry: Theory and Laboratory Skills	H92V 35*	1	7
	Employment Experience 2	D77H 34	1	7
	Fluid Mechanics: Theory and Practice	HE3E 34*	1	7
	Fundamental Concepts of Inorganic Chemistry Or Inorganic Chemistry: Theory and Laboratory Skills	DP2N 34 Or H92Y 34	1 1	7 7
	Fundamental Concepts of Physical Chemistry Or Physical Chemistry: Theory and Laboratory Skills	DP2R34 Or H936 34	1 1	7 7
	Fundamental Concepts of Organic Chemistry Or Organic Chemistry: Theory and Laboratory Skills	DP2P34 Or H933 34	1 1	7 7
	Genetics	DP4P 34	1	7
	Heat Transfer: Theory and Practice Or Heat Transfer Theory and Practical Skills	F3XC 34 H97T 34*	 1	 7
	Information Technology: Applications	D75X34	1	7

	Unit title	Number	Credit value	Level
	Software 1			
	Industrial Chemicals: Processes and Products	HE3G 34*	1	7
	Mathematics for Science 2	H8XR 34*	1	7
	Microbiology: Theory and Laboratory Skills	H92G 34*	2	7
	Pestology	DV9E 34	1	7
	Physics 2	H93E 34 *	1	7
	Process Safety Engineering	HE3F 34*	1	7
	Presentation Skills in Science	DG70 34	1	7
	Plant Biology	H92H 35*	1	7
	Process Control	DX4K 34	1	7

Options Section B (0–3 Credits) Maximum	Applications of Transition Metal Compounds	H92M 35*	1	8
	Aquatic Ecosystems	DP4V 35	1	8
	Aromatic Chemistry Or Aromatic Chemistry: Theory and Laboratory Skills	DP54 35 Or H92N 34	1	8
	Base-Catalysed Reactions and Organometallic Reagents in Organic Synthesis Or Base-Catalysed and Organometallic Chemistry: Theory and Laboratory Skills	DP5W 35 Or H92P 35	1	8
	Bioinformatics	DV9D 35	1	8
	Biomedical Investigations	H924 35*	1	8
	Biomedical Pathology	H925 35*	1	8
	Cellular Signalling	H928 35*	1	8
	DNA Molecular Techniques: Theory and Practice Or DNA Molecular Techniques	DJ6X 35 Or H92A 35	2	8
	Electrochemistry Or Electrochemistry	DP5V 35 Or H92T 35	1	8
	Environmental Sampling and Analysis	DT4X 35	1	8
	Food Science: Theory and Practice	DH9Y 35	1	8
	Human Body Structure and Function	H92C 35*	2	8
	Human Metabolism	H92D 35*	2	8

	Unit title	Number	Credit value	Level
Options (cont'd)	Immunological Techniques: Theory and Practice Or Immunological Techniques	DH2L 35 Or H92E 35	1 1	8 8
	Immunotechnology: Theory and Practice	DH2M 35	1	8
	Instrumental Techniques: Theory and Practice 1 Or Instrumental Techniques 1	DH54 35 Or H930 35	1 1	8 8
	Instrumental Techniques: Theory and Practice 2 Or Instrumental Techniques 2	DH2N 35 Or H931 35	1 8	8 8
	Main Group Inorganic Chemistry Or Main Group Inorganic Chemistry	DV9F 35 Or H932 35	1 1	8 8
	Medicinal Chemistry	DP4W 35	1	8
	Microbiological Techniques	H92F 35*	2	8
	Organic Stereochemistry Or Organic Stereochemistry: Theory and Laboratory Skills	DX2H 35 Or H934 35	1 1	8 8
	Phase Equilibrium and Surface Chemistry Or Phase Equilibrium and Surface Chemistry	DP5X 35 Or H935 35	1 1	8 8
	Physics 1	H93D 33*	1	6
	Protein Structure and Function	H92J 35*	1	8
	Process Operations: Heat Exchange, Drying and Evaporation	HE3J 35*	1	8
	Process Operations: Distillation OR Process Operations: Distillation	F3XF 35 H97R 35*	1 1	8 8
	Science Industry: Key Issues Or Science Industry: Key Issues	DP9M 34 Or H92K 34	1 1	7 7
	Statistics for Science 2	H8XV 34*	1	7
	Terrestrial Ecosystems	DP4X 35	1	8
	Thermodynamics and Kinetics Or Thermodynamics and Kinetics: Theory and Laboratory Skills	DP4N 35 Or H938 35	1 1	8 8
	Transition Metal Chemistry Or Transition Metal Chemistry: Theory and Laboratory Skills	DR0E 35 Or H939 35	1 1	8 8

*Refer to History of Changes for revision changes.

Candidates will be awarded a PDA Laboratory Science on successful completion of 64 SCQF credit points which will include successful achievement of all the Units in the mandatory section (4 mandatory Unit credits) and 4 optional Unit credits giving a total of 8 credits.

Core Skills

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

Core Skill	Recommended Entry level	Recommended Exit level
Communication	Intermediate 2	Higher
Numeracy	Higher	Higher
Information Technology	Intermediate 2	Higher
Problem Solving	Intermediate 2	Higher
Working with Others	Intermediate 2	Higher

5.2 Mapping information

Appendix 1 details the mapping of the National Occupational Standards to the Professional Development Award. Each mandatory Unit has been mapped to the appropriate National Occupational standard.

5.3 Articulation, professional recognition and credit transfer

In designing the award, the Development Group was fully aware of the need for the qualification to contain relevant technical and transferable skills to enable immediate entry to employment while at the same time allowing articulation to degree courses. The Development Group ensured that an appropriate balance between academic and vocational knowledge and skills was achieved through the mix of Unit content and teaching approaches. Care was taken in the design of this award to ensure that topics and Units required to maintain articulation routes were included. Thus no difficulties are foreseen in developing and maintaining existing articulation routes.

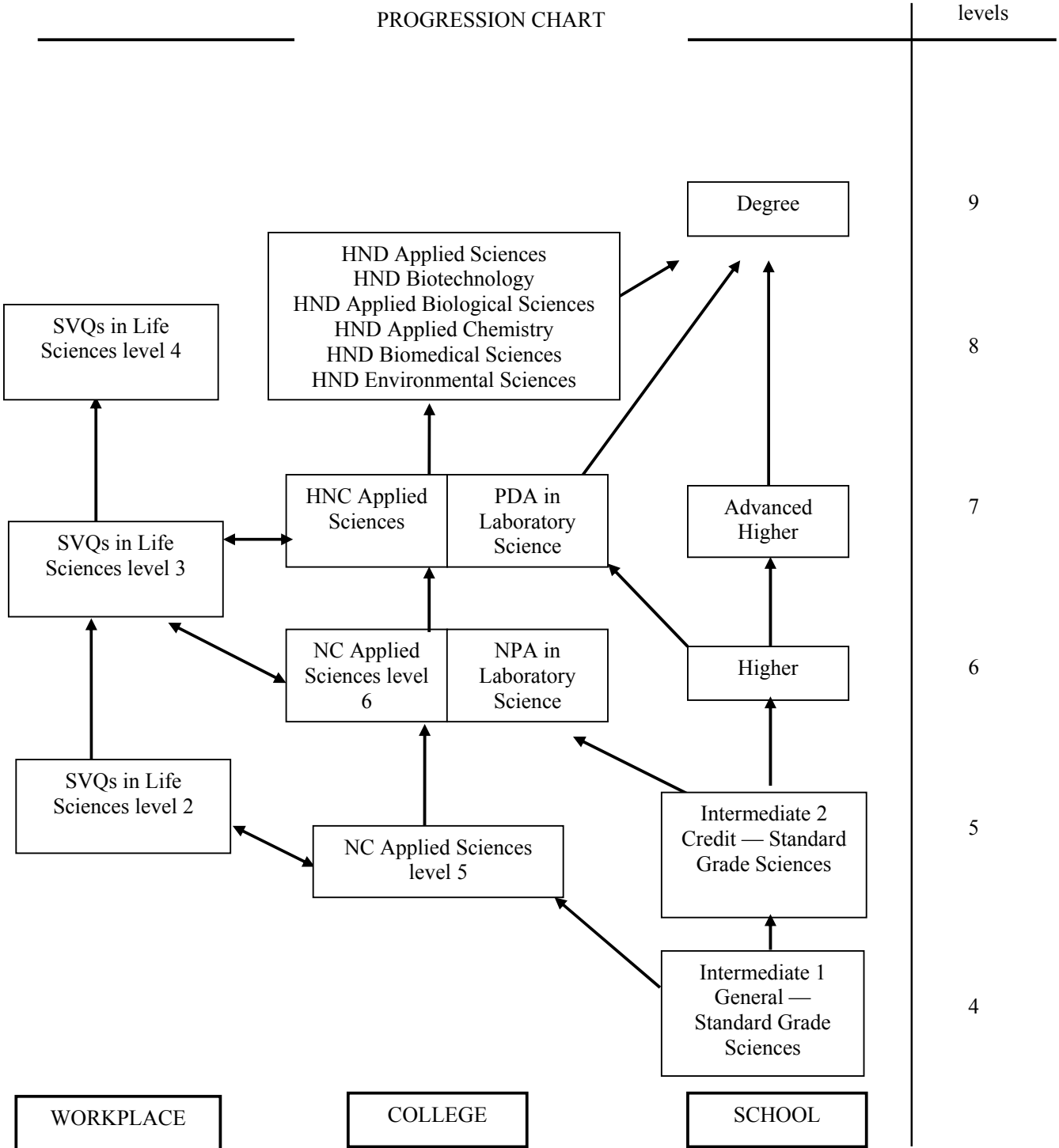
Articulation agreements are already in place for the existing HNC/HND Science awards. Progression can be facilitated from NPA to PDA and onto HNC/D. Examples of existing support from various universities are as follows:

Examples of existing Articulation Arrangements (HND)

HE Institution	Articulation from HND
University of the West of Scotland	Third year of BSc (Hons) Sciences
Glasgow Caledonian University	Third year of BSc (Hons)
University of Strathclyde	Second year of BSc (Hons)
University of Edinburgh	Third year of BSc
University of Stirling	Second year of BSc
Napier University, Edinburgh	Third year of BSc
University of St Andrews	Second/third year of BSc (Hons)
Robert Gordon University, Aberdeen	Third year of BSc
University of Abertay, Dundee	Third year of BSc
University of Dundee	Second/third year of BSc
Heriot Watt University	Third Year of MChem

Moreover, the clearly defined progression routes in Figure 1 (page 8) highlight learning pathways.

FIGURE 1



6 Approaches to delivery and assessment

6.1 Content and context

The PDA Laboratory Science is a specialised award which allows candidates to gain knowledge and technical skills in quality issues, microbiology, chemistry, quantitative skills and other science areas. As such, it is intended to prepare candidates for employment at technician or technologist level in science laboratories. Moreover, the PDA supports the Life Sciences level 3 Modern Apprenticeship.

The award develops clear career and education pathways for learners including a range of study options in Higher Education, particularly in the field of science.

6.2 Core Skills

Details on how Core Skills can be developed during these awards is given in Appendix 2.

6.3 Delivery and assessment

Although centres can choose the order in which to teach the Units within the award, it is advised mandatory Units are delivered initially as these support optional Units. Moreover, where candidates are taking bridging Units these should also be delivered in the initial period of teaching.

The assessment strategy is designed to encourage a more holistic approach to assessment. The Unit specifications place the emphasis on reducing the assessment load for candidates and centres by specifying assessments which assess the entire theory content of the Unit where appropriate, and by sampling of knowledge and/or skills carried out under closed-book conditions on a random basis to ensure the candidates do not have prior knowledge of the sample.

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

Assessment exemplar material for all year 1 core Units is available from SQA.

Where appropriate centres can access e-assessment tools for both formative and summative assessment. Many of the Units also can be supported by e-learning.

6.4 Flexible Learning

The PDA could be delivered flexibly in partnership with employers and individuals. Candidates would have to attend the presenting centre or other agreed institution to complete the practical assessments. Centre-devised supervision agreements should detail controlled conditions to ensure authenticity of evidence.

6.5 Credit transfer transition arrangements

In principle, candidates can be given credit transfer between relevant Units previously achieved and new Units.

7 General information for centres

Disabled candidates and/or those with additional support needs

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

Internal and external verification

All instruments of assessment used within this Group Award 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

Centres should provide candidates with a brief summary of the Group Award before they commence on their course of study. It should include information on what the Group Award is about, and provide information on the knowledge and skills which will be developed, what is involved in assessment, Core Skills, and the conditions of the award.

This would normally be presented as part of the information in a course handbook and should include information on the possible routes of progression in education or types of employment available for candidates obtaining the qualification.

Industries which encompass science are diverse including:

- ◆ Chemicals
- ◆ Oil and gas
- ◆ Life Sciences
- ◆ Health
- ◆ Food and drink

Employers in these industries have expressed a need for technically competent scientists. This qualification will support those working as laboratory technologists, those who hope to gain employment in a laboratory and also support the Modern Apprenticeship in Life Sciences (level 3).

Learners should have some prior science knowledge at SCQF level 6. The course content is flexible and supports biological, chemical and environmental science.

The PDA includes Units from the HNC/HND science portfolio. Successful candidates could progress to an HND and then progress to year 3 of a degree.

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 Unit to cover Core Skills: This is a non-subject Unit that is written to cover one or more particular Core Skills.

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/HND 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 National Occupational Standards to Units

Appendix 2: Core Skills mapping

Appendix 1: Mapping of National Occupational Standards

SVQ: Level 3 Laboratory Science

Unit code	Unit title	National Occupational Standard																					
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	22		
DF82 34	Quality and Health & Safety Systems in Science Industries	√	√	√																			
DH2K 34	Fundamental Chemistry: Theory and Practice				√		√	√	√	√						√							
H8XP 33 OR H8XT 34	Mathematics for Science 1 OR Statistics for Science 1				√	√										√							

Underpinning knowledge optional Units also map to the optional VQ Units.

PDA National Occupational Standards

- 1 Maintaining health and safety in a laboratory environment
- 2 Maintaining effective and efficient working relations
- 3 Providing leadership for a laboratory team
- 4 Encouraging problem solving and innovation in a laboratory team
- 5 Managing budgets for laboratory projects
- 6 Analysing laboratory specimens using HPLC
- 7 Analysing laboratory specimens using GC
- 8 Analysing laboratory specimens using GCMS
- 9 Analysing laboratory specimens using GCTC
- 10 Analysing DNA/RNA samples using PCR and quantitative PCR
- 11 Amplifying DNA samples using PCR
- 12 Maintaining cell lines for laboratory activities using cryogenic storage
- 13 Culturing/fermenting cells for laboratory activities using control batch or continuous culture fermentation
- 14 Maintaining cell lines for laboratory activities using sub culture
- 15 Measuring, weighing and preparing compounds and solutions for laboratory use
- 16 Separating samples for laboratory activities using centrifugation
- 17 Analysing laboratory samples using light microscopy
- 18 Analysing laboratory samples using UV-Vis
- 19 Analysing laboratory samples using CD
- 20 Analysing laboratory samples using FT-IR spectroscopy
- 21 Analysing laboratory samples using light chromatography
- 22 Using and communicating information to laboratory personnel
- 23 Analysing DNA using Gel Electrophoresis

Appendix 2: Core Skills mapping

Communication (Higher)

Units	Core Skills				
	Numeracy	Communication	Information Technology	Problem Solving	Working with Others
Statistics for Science	✓ Higher				
Presentation Skills in Science		✓ Embedded Higher			
Information Technology: Applications Software 1			✓ Embedded Higher		
Quality and Health & Safety Systems in Science Industries		✓ Higher			✓ Intermediate 2
Fundamental Chemistry: Theory and Practice	✓ Higher	✓ Higher		✓ Higher	
Cell Biology: Theory and Practice		✓ Higher			
Fundamental Concepts of Inorganic Chemistry	✓ Higher	✓ Higher			
Fundamental Concepts of Organic Chemistry		✓ Higher			
Fundamental Concepts of Physical Chemistry	✓ Higher	✓ Higher			
Biochemistry: Theory and Practice		✓ Higher			
Applied Biomedical Techniques: An Introduction	✓ Higher	✓ Higher		✓ Higher	
Mathematics for Science 1		✓ Higher		✓ Higher	
Physics 1	✓ Higher	✓ Higher			
HNC Graded Unit		✓ Higher		✓ Higher	
HND Graded Unit		✓ Higher		✓ Higher	
Instrumental Techniques: Theory and Practice 1		✓ Higher		✓ Higher	
Instrumental Techniques: Theory and Practice 2		✓ Higher		✓ Higher	
Aromatic Chemistry		✓ Higher		✓ Higher	
Base Catalysed reactions and organometallic reagents in organic synthesis		✓ Higher			
Applications of Transition Metal Compounds	✓ Higher	✓ Higher		✓ Higher	
Electrochemistry		✓ Higher		✓ Higher	
Phase Equilibrium and Surface Chemistry		✓ Higher			

Units	Core Skills				
	Numeracy	Communication	Information Technology	Problem Solving	Working with Others
Kinetics and Thermodynamics		✓ Higher	✓ Higher	✓ Higher	
Environmental Chemistry: Theory and Laboratory Skills		✓ Higher		✓ Higher	✓ Higher
Medicinal Chemistry					✓ Higher
Biotechnology: An introduction					
Science Industry: An Introduction					✓ Higher

Unit	Knowledge and Skills/Evidence	Developed/ Assessed	a	b
Presentation Skills in Science	Outcome 2	Assessed	√	√
Quality and Health & Safety in Science Industry	Outcome 1 and 2	Developed	√	√
Fundamental Chemistry: Theory and Practice	Outcome 1	Developed	√	√
Cell Biology: Theory and Practice	Outcomes 1, 2 and 4	Developed	√	√
DNA Structure and Function	Outcomes 1–5	Developed	√	√
DNA Molecular Techniques: Theory and Practice	Outcomes 1–4	Developed	√	√
Microbiology: Theory and Laboratory Skills	Outcomes 1–3	Developed	√	√
Microbiological Techniques: Theory and Practice	Outcomes 1–4	Developed	√	√
Immunological Techniques	Outcomes 1 and 2	Developed	√	√
Instrumental Techniques: Theory and Practice 1	Outcomes 1 and 2	Developed	√	√
Animal and Plant Cell Culture: An Introduction	Outcomes 1–3	Developed	√	√
Immunotechnology: Theory and Practice	Outcomes 1–3	Developed	√	√
Biochemistry: Theory and Practice	Outcomes 123	Developed	√	√
Applied Biomedical Techniques: An Introduction	Outcomes 1–4	Developed	√	√

Unit	Knowledge and Skills/Evidence	Developed/ Assessed	a	b
Human Body Structure and Function	Outcomes 1–6	Developed	√	√
Biomedical Pathology	Outcomes 1–3	Developed	√	√
Biomedical Investigations	Outcomes 1–3	Developed	√	√
Cellular Communication	Outcomes 1–4	Developed	√	√
Human Metabolism	Outcomes 1–5	Developed	√	√
Protein Structure and Function	Outcomes 1–4	Developed	√	√
Genetics	Outcomes 1–4	Developed	√	√
Bioinformatics	Outcomes 1 and 2	Developed	√	√
Medicinal Chemistry	Outcomes 1–4	Developed	√	√

Written Communication (Writing)

Produce well-structured Written Communication on complex topics

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

Unit	Knowledge/Skills/Evidence	Developed/ assessed	a	b	c	d	e
Presentation Skills in Science	Outcomes 1 and 3	Assessed	√	√	√	√	√
Quality and Health & Safety in Science Industry	Outcome 3	Developed	√	√	√	√	√
Fundamental Chemistry: Theory and Practice	Outcomes 1 and 2	Developed	√	√	√		
Cell Biology: Theory and Practice	Outcomes 1,2 and 4	Developed	√	√	√		
DNA Structure and Function	Outcomes 1–5	Developed	√	√	√		
DNA Molecular Techniques: Theory and Practice	Outcomes 1–4	Developed	√	√	√		
Microbiology: Theory and Laboratory Skills	Outcomes 1–4	Developed	√	√	√		
Microbiological Techniques	Outcomes 1–5	Developed	√	√	√		
Immunological Techniques	Outcomes 1–3	Developed	√	√	√		
Instrumental Techniques: Theory and Practice 1	Outcomes 1–3	Developed	√	√	√		
Animal and Plant Cell Culture: An Introduction	Outcomes 1–4	Developed	√	√	√		
Food Science: Theory and Practice	Outcomes 1–3	Developed	√	√	√		
Immunotechnology: Theory and Practice	Outcomes 1–3	Developed	√	√	√		
Biochemistry: Theory and Practice	Outcomes 1–3	Developed	√	√	√		
Applied Biomedical Techniques: An Introduction	Outcomes 1–4	Developed	√	√	√		
Instrumental Techniques: Theory and Practice 2	Outcomes 1–3	Developed	√	√	√		

Unit	Knowledge/Skills/Evidence	Developed/ assessed	a	b	c	d	e
Human Body Structure and Function	Outcomes 1–6	Developed	√	√	√	√	√
Biomedical Pathology	Outcomes 1–3	Developed	√	√	√	√	√
Biomedical Investigations	Outcomes 1–3	Developed	√	√	√		
Cellular Communication	Outcomes 1–4	Developed	√	√	√		
Human Metabolism	Outcomes 1–6	Developed	√	√	√		
Protein Structure and Function	Outcomes 1–4	Developed	√	√	√		
Genetics	Outcomes 1–4	Developed	√	√	√		
Bioinformatics	Outcome 1	Developed	√	√	√		
Medicinal Chemistry	Outcomes 1–4	Developed	√	√	√		

Oral Communication

Produce and respond to oral Communication on a complex topic

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

Unit	Knowledge/Skills/Evidence	Developed/ Assessed	a	b	c	d	e
Presentation Skills in Science	Outcome 4	Assessed	√	√	√	√	√

Using Information Technology (Higher)

Use an IT system independently to process a range of information

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

Unit	Knowledge/Skills/Evidence	Developed/ Assessed	a	b	c	d
Information Technology: Applications Software 1	Embedded in Unit	Assessed	√	√	√	√
Bioinformatics	Outcomes 1 and 2	Developed	√		√	√

Numeracy (Higher)

Skill component Using Number

Apply a wide range of numerical skills

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

Unit	Knowledge/Skills/Evidence	Developed/ Assessed	a	b	c
Statistics for Science	Outcomes 1 and 2	Developed	√	√	√
Fundamental Chemistry: Theory and Practice	Outcomes 1 and 2	Developed	√	√	√
Microbiology: Theory and Laboratory Skills	Outcomes 2, 3 and 4	Developed	√	√	√
Microbiological Techniques: Theory and Practice	Outcomes 2 and 4	Developed	√	√	√
Applied Biomedical Techniques: An Introduction	Outcomes 1 and 2	Developed	√	√	√
Instrumental Techniques: Theory and Practice 2	Outcomes 1–3	Developed	√	√	√
Human Body Structure and Function	Outcome 3, 4 and 6	Developed	√	√	√

Numeracy (Higher)

Skill component Using graphical information

Interpret and communicate graphical information in everyday and generalised contexts

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

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

Numeracy (Higher)

Skill component Using Number

Apply in combination a wide range of numerical/statistical and other mathematical skills to process complex information

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

Unit	Knowledge/Skills/Evidence	Developed/ assessed	a	b	c
Statistics for Science	Outcomes 1 and 2	Developed	√	√	√
Fundamental Chemistry: Theory and Practice	Outcomes 1 and 2	Developed	√	√	
Microbiology: Theory and Laboratory Skills	Outcomes 2, 3 and 4	Developed	√	√	√
Applied Biomedical Techniques: An Introduction	Outcomes 2 and 4	Developed	√	√	√
Instrumental Techniques: Theory and Practice 2	Outcomes 1–4	Developed	√	√	√

Problem Solving (Higher)

Skill components Critical Thinking Analyse a complex situation or issue

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

Unit	Knowledge/Skills/Evidence	Developed/ assessed	a	b	c
Fundamental Chemistry: Theory and Practice	Outcomes 1 and 2	Developed	√	√	√
DNA Molecular Techniques: Theory and Practice	Outcome 5	Developed	√	√	√
Protein Structure and Function	Outcomes 1–4	Developed	√	√	√
Immunological Techniques	Outcome 1–3	Developed	√	√	√
Instrumental Techniques: Theory and Practice 1	Outcomes 1–3	Developed	√	√	√
Animal and Plant Cell Culture: An Introduction	Outcomes 1–4	Developed	√	√	√
Applied Biomedical Techniques: An Introduction	Outcomes 1–4	Developed	√	√	√

Problem Solving (Higher)

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.

Unit	Knowledge/Skills/Evidence	Developed/ assessed	a	b	c
Fundamental Chemistry: Theory and Practice	Outcome 2	Developed	√	√	√
DNA Molecular Techniques: Theory and Practice	Outcome 5	Developed	√	√	√
Protein Structure and Function	Outcome 4	Developed	√	√	√
Immunological Techniques	Outcome 3	Developed	√	√	√
Instrumental Techniques: Theory and Practice	Outcomes 1–3	Developed	√	√	√
Animal and Plant Cell Culture: An Introduction	Outcome 4	Developed	√	√	√
Applied Biomedical Techniques: An Introduction	Outcomes 1–4	Developed	√	√	√

Problem Solving (Higher)

Skill components Reviewing and Evaluating

Review and evaluate a complex problem solving activity

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

Unit	Knowledge/Skills/Evidence	Developed/ assessed	a	b	c
Fundamental Chemistry: Theory and Practice	Outcome 3	Developed	√	√	√
Immunological Techniques	Outcome 3	Developed	√	√	√
Instrumental Techniques: Theory and Practice 1	Outcomes 1–3	Developed	√	√	√
Applied Biomedical Techniques: An Introduction	Outcomes 1–4	Developed	√	√	√

Working with Others (Intermediate 2)

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

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

Unit	Knowledge/Skills/Evidence	Developed/ Assessed	a	b	c	d	e
Quality and Health & Safety Systems in Science Industries	Outcome 3	Developed	√	√	√		
Protein Structure and Function	Outcome 4	Developed	√	√	√		
Employment Experience 2	Outcomes	Developed	√	√	√	√	√