



## Higher National Graded Unit specification

### General information for centres

This Graded Unit has been validated as part of the HND Biotechnology. Centres are required to develop the assessment instrument in accordance with this validated specification. Centres wishing to use another type of Graded Unit or assessment instrument are required to submit proposals detailing the justification for change for validation.

**Unit Title:** Biotechnology: Graded Unit 2

**Graded Unit Code:** DJ8A 35

**Type of Graded Unit:** Project

**Assessment Instrument:** Practical Assignment

**Credit value:** 2 HN Credits at SCQF level 8: (16 SCQF credit points at SCQF level 8\*)

*\*SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

**Purpose:** This Graded Unit is designed to provide evidence that the candidate has achieved the following principal aims of the HND Biotechnology:

- ◆ developing candidates' knowledge and skills such as planning, developing and evaluating
- ◆ developing employment skills and enhancing candidates' employment prospects
- ◆ enabling progression within the Scottish Credit and Qualifications Framework (SCQF)
- ◆ developing transferable skills including Core Skills
- ◆ preparing for employment in a Biotechnology-related post at technician or professional level
- ◆ developing a range of vocational skills appropriate to employment at technician or professional level in the Biotechnology sector
- ◆ develop investigation skills
- ◆ develop knowledge and skills in planning and project management

**Recommended Prior Knowledge and Skills:** It is recommended that the candidate should have completed or be in the process of completing the following Units relating to the above specific aims prior to undertaking this Graded Unit:

- ◆ DG70 34 *Presentation Skills in Science*
- ◆ D75X 34 *Information Technology: Applications Software 1*
- ◆ DN8C 34 *Statistics for Science 1*
- ◆ DF82 34 *Quality and Health and Safety Systems in Science Industries*
- ◆ DH2K 34 *Fundamental Chemistry: Theory and Practice*

## Higher National Graded Unit Specification

### General Information for Centres (cont)

- ◆ DJ1K 34 *Cell Biology: Theory and Practice*
- ◆ DJ6Y 34 *DNA: Structure and Function*
- ◆ DH55 34 *Microbiology: Theory and Practice*
- ◆ DJ00 34 *Biotechnology: An Introduction*
- ◆ DJ89 34 *Applied Sciences: Graded Unit 1*
- ◆ DJ6X 34 *DNA and Molecular Techniques: Theory and Practice*
- ◆ DG6X 35 *Protein Structure and Function: Theory and Practice*
- ◆ DH2P 35 *Microbiological Techniques: Theory and Practice*
- ◆ DH2M 35 *Immunotechnology: Theory and Practice*
- ◆ DH54 35 *Instrumental Techniques: Theory and Practice*
- ◆ DP9M 34 *Science Industry: Key Issues*
- ◆ DH2H 34 *Animal and Plant Cell Culture: An Introduction*

**Core Skills:** The achievement of this Unit gives automatic certification of the following:

Problem Solving at SCQF level 5

**Assessment:** This Graded Unit will be assessed by the use of a Practical Assignment which includes a scientific report. The developed Practical Assignment should provide the candidate with the opportunity to produce evidence that demonstrates she/he has met the aims of the Graded Unit.

An assessment exemplar pack has been produced to provide centres and candidates with clear guidance as to the national standard of achievement required at SCQF level 8.

## Administrative Information

**Graded Unit Code:** DJ8A 35

**Graded Unit Title:** Biotechnology: Graded Unit 2

**Original date of publication:** August 2004

**Version:** 03 (July 2007)

### History of Changes:

Version	Description of change	Date
02	Revision of Unit specification to update grading checklists, Marking schedule and formatting.	30/04/07
03	Minor layout/spelling adjustments	13/07/07

**Source:** SQA

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## **Higher National Graded Unit Specification: Instructions for designing the assessment task and assessing candidates**

### **Graded Unit Title: Biotechnology: Graded Unit 2**

#### **Conditions of Assessment**

The candidate should be given a date for completion of the Practical Assignment. However, the instructions for the assessment task should be distributed to allow the candidate sufficient time to assimilate the details and carry out the assessment task. During the time between the distribution of the assessment task instructions and the completion date, assessors may answer questions, provide clarification, guidance and reasonable assistance. The assessment task should be marked as soon as possible after the completion date. The final grading given should reflect the quality of the candidate's evidence at the time of the completion date.

The evidence for the project is generated over time and involves three distinct stages, where each stage has to be achieved before the next is undertaken. Thus any reassessment of stages must be undertaken before proceeding to the next stage.

If a candidate fails the project overall or wishes to upgrade, then this must be done using a *substantially different* project, ie all stages are undertaken using a new project, assignment, case study, etc. In this case, a candidate's grade will be based on the achievement in the re-assessment, if this results in a higher grade.

At this level candidates should work independently, ie without undue assistance from the assessor. It is up to Centres to take reasonable steps to ensure that the project is the work of the candidate. For example, Centres may wish to informally question candidates at various stages on their knowledge and understanding of the case study on which they have embarked. Centres should ensure that where research etc, is carried out in other establishments or under the supervision of others that the candidate does not receive undue assistance.

#### **Instructions for designing the assessment task**

The assessment task is a project. The project undertaken by the candidate must be a complex task which involves:

- ◆ variables which are complex or unfamiliar
- ◆ relationships which need to be clarified
- ◆ a context which may be familiar or unfamiliar to the candidate

The assessment task must require the candidate to:

- ◆ analyse the task and decide on a course of action for undertaking the project
- ◆ plan and organise work and carry it through to completion
- ◆ reflect on what has been done and draw conclusions for the future
- ◆ produce evidence of meeting the aims which this Graded Unit has been designed to cover

## Higher National Graded Unit Specification: Instructions for designing the assessment task and assessing candidates (cont)

### Graded Unit Title: Biotechnology: Graded Unit 2

#### Guidance on grading candidates

The project will be marked out of 100. Assessors will mark each stage of the project, taking into account the criteria outlined. The marks will then be aggregated to arrive at an overall mark for the project. Assessors will then assign an overall grade to the candidate for this graded Unit based on the following grade boundaries.

- A = 70% — 100%
- B = 60% — 69%
- C = 50% — 59%

Candidates who meet the minimum evidence requirements will have their achievement graded as C — competent, or A — highly competent or B somewhere between A and C. The grade related criteria to be used to judge candidate performance for this Graded Unit is specified in the following table.

Grade A	Grade C
<p>Is a seamless, coherent piece of work:</p> <ul style="list-style-type: none"> <li>◆ The project brief accurately specifies the project in both technical and non-technical terms and is prepared in a clear and concise manner.</li> <li>◆ The project objectives accurately and fully reflect the long term project targets.</li> <li>◆ The initial project plan contains a comprehensive list of project activities and timings. The information in the initial plan is used to assess if the project can be completed within timescales. The schedule is monitored on a regular basis to inform on-going project planning and development.</li> <li>◆ The candidate develops a substantial knowledge base to support the demands of the project.</li> </ul>	<p>Is a co-ordinated piece of work:</p> <ul style="list-style-type: none"> <li>◆ The project brief includes accurate information about the main technical and non-technical requirements of the project.</li> <li>◆ The project objectives identify the key long term project targets.</li> <li>◆ The initial project plan shows all essential project activities and timings. Evidence that the plan has been monitored on a number of occasions during the life of the project to inform on-going project planning and development should be available.</li> <li>◆ The candidate develops a sound knowledge base to support the demands of the project.</li> </ul>

## Higher National Graded Unit Specification: Instructions for designing the assessment task and assessing candidates (cont)

### Graded Unit Title: Biotechnology: Graded Unit 2

Grade A	Grade C
<ul style="list-style-type: none"> <li>◆ The candidate undertakes the project with the minimum of supervision. Where the candidate feeds back to his/her supervisor it is on a proactive basis, updating the supervisor on progress made and actions for the next stage of the project.</li> <li>◆ The candidate identifies all known project risks, categorises them in terms of their likely level of occurrence and identifies actions for minimising such risks.</li> <li>◆ The candidate undertakes all practical activities according to current Health and Safety requirements and applies good laboratory practice to a high standard.</li> <li>◆ Demonstrates appropriate use of one or more types of instrumentation/equipment to a complex level and a high standard (eg using the more advanced features of the equipment competently).</li> <li>◆ Analysis of results is accurate and comprehensive, takes account of all known sources of error and is either substantiated in terms of known theory and/or identifies limitations in theory.</li> <li>◆ The diary is regularly maintained and provides a detailed, informal record of results, candidate's thinking as the project develops including reflective comments.</li> <li>◆ The project report is well structured, contains only relevant information, is technically accurate, uses clear and correct English and has clear and accurate conclusions and recommendations.</li> <li>◆ The project report includes a full analysis of results, and a comprehensive evaluation of the project against project objectives.</li> </ul>	<ul style="list-style-type: none"> <li>◆ The candidate undertakes the project with interventions from the project supervisor, to ensure the project remains on track.</li> <li>◆ The candidate identifies main risks that are likely to occur during the progress of the project and identifies main actions for minimising such risks.</li> <li>◆ The candidate undertakes all practical activities according to current Health and Safety requirements and applies good laboratory practice to a standard regarded as acceptable in a scientific setting.</li> <li>◆ Demonstrates appropriate use of one or more types of instrumentation/equipment to a standard that is acceptable within a scientific setting.</li> <li>◆ Analysis of results is sufficiently accurate and detailed and takes account of main sources of error and establishes key relationships between results and theory.</li> <li>◆ The diary contains a sufficient level of details about project ideas, results and progress and there is evidence that entries have been made on a number of occasions during the life of the project.</li> <li>◆ The project reports meets acceptable standards in terms of structure, technical accuracy, use of English and has accurate conclusions and recommendations.</li> <li>◆ The project includes an analysis of results, an evaluation of the project against the project objectives.</li> </ul>

## Higher National Graded Unit Specification: Instructions for designing the assessment task and assessing candidates (cont)

### Graded Unit Title: Biotechnology: Graded Unit 2

Grade A	Grade C
<ul style="list-style-type: none"><li>◆ The candidate identifies clear and full details of the new knowledge and skills she/he has developed as a result of doing the project such as project management skills, keeping to deadlines, recognising limitations of knowledge — approaching expert sources.</li><li>◆ The candidate demonstrates a high level of self motivation throughout the project.</li><li>◆ The candidate undertakes additional research beyond that demanded by the project.</li></ul>	<ul style="list-style-type: none"><li>◆ The candidate provides a number of examples of new knowledge and skills she/he has developed as a result of doing the project.</li><li>◆ The candidate demonstrates an acceptable level of motivation throughout the project.</li><li>◆ The candidate undertakes research demanded by the project.</li></ul>

**Important Note:** Centres **must** complete the following Graded Checklist for each Biotechnology Project. Completed checklists will be used as part of the external verification process to ensure the accuracy and consistency of grading between candidates in the centre and across the centres.

**Notes of completion of the Grading Checklist are shown on page 10.**

## Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

### Graded Unit Title: Biotechnology: Graded Unit 2

#### Evidence requirements

The project consists of three stages: planning; developing; and evaluating. The following table specifies the minimum evidence required to pass each stage.

**Note:** The candidate must achieve **all of the minimum evidence** specified below for each stage of the project in order to pass the Graded Unit.

**Candidates failing to achieve any of the minimum Evidence Requirements for all three sections should be offered the chance to re-submit the outstanding evidence.**

**Re-submitted work should be awarded marks using a scale based on 50% of the original marks available.**

Project Stage	Minimum Evidence Requirements
Stage 1 — Planning	<p>Planning Report which includes:</p> <ul style="list-style-type: none"> <li>◆ the project brief</li> <li>◆ the candidate's development of the brief</li> <li>◆ any information gathered to clarify the brief</li> <li>◆ a set of project objectives</li> <li>◆ aims of the practical assignment</li> <li>◆ identification of materials and resources required and how they will be accessed</li> <li>◆ identification of the stages involved and the timescales for completion of each stage (project plan)</li> <li>◆ identification of appropriate Health and Safety procedures</li> </ul> <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Planning stage. This will account for 20% of the total mark.</i></p>
Stage 2 — Developing	<ul style="list-style-type: none"> <li>◆ output (scientific report) of the practical activity</li> </ul> <p>and</p> <ul style="list-style-type: none"> <li>◆ record of the processes underpinning the activity eg logbook/diary and progress report</li> </ul> <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Developing stage. This will account for 50% of the total mark.</i></p>

## Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

### Graded Unit Title: Biotechnology: Graded Unit 2

Project Stage	Minimum Evidence Requirements
Stage 3 — Evaluating	<p>Evaluation Report which should:</p> <ul style="list-style-type: none"><li>◆ contain an abstract</li><li>◆ review and update the action plan in light of experience</li><li>◆ summarise any unforeseen events and how they were handled</li><li>◆ identify knowledge and skills which have been gained and/or developed</li><li>◆ assess the strengths and weaknesses of the output of the Practical Assignment</li><li>◆ determine to what extent the assignment met the original brief</li><li>◆ suggest potential development themes for the project</li></ul> <p><i>The candidate must achieve all of the minimum evidence specified above in order to pass the Evaluating stage. This will account for 30% of the total mark.</i></p>

## Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

### Graded Unit Title: Biotechnology: Graded Unit 2

#### Support notes

Centres may provide additional comments in support of their grading decisions. A candidate may be awarded less than the mark allocation for a grade C in appropriate circumstances.

#### Grading checklists

Project Stage	Minimum Evidence Requirements	Maximum mark	Mark Grade C	Mark awarded
Planning	<p><b>The project brief</b> Accurately specifies the project in both technical and non-technical terms and is prepared in a clear and concise manner.</p>			
	<p>◆ <b>The candidate's development of the brief</b> Evidence of analysing and interpreting what is involved in the practical project brief and presenting it in a clear and concise manner.</p>	2	1	
	<p>The identification of the key factors influencing the project and their interrelationships.</p>	2	1	
	<p>◆ <b>Any information gathered to clarify the brief</b> Evidence of information gathered ie references/articles/websites. Identification of information sources to be used.</p>	2	1	
	<p>◆ <b>Aims of the practical assignment/ investigation</b></p>	2	1	
	<p>◆ <b>Set of project objectives</b> Accurately and fully reflect the long term project targets.</p>	2	1	
	<p>◆ <b>Identification of materials and resources required and how they will be accessed</b> Evidence that the candidate has identified the material/resources required to complete the project, and where they can be accessed.</p>	3	1	
<p>◆ <b>Identification of the stages involved</b></p>	2	1		

## Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

### Graded Unit Title: Biotechnology: Graded Unit 2

Project Stage	Minimum Evidence Requirements	Maximum mark	Mark Grade C	Mark awarded
Planning continued	<p>◆ <b>The timescales for completion of each stage (project plan)</b> The initial project plan contains a comprehensive list of project activities and timings. The information in the initial plan is used to assess if the project can be completed within timescales. The schedule is monitored on a regular basis to inform on-going project planning and development.</p>	2	1	
	<p>◆ <b>Identification of appropriate Health and Safety procedures</b> Identifies all known project risks, categorises them in terms of their likely level of occurrence and identifies actions for minimising such risks.</p>	3	2	
	<p>The candidate must achieve <b>all</b> of the minimum evidence specified above in order to pass the planning stage. This will account for 20% of the total mark. If the assessor forms the view that the work finally submitted by the candidate is so weak as to prevent the candidate progressing to the next stage, the candidate may receive additional assistance (over and above the norm). In this event, the assessors will record this fact and the candidate may receive no more that <b>half</b> (10) of the available marks for this stage.</p>	<b>Total 20</b>	<b>Minimum 10</b>	
Developing	<p><b>Output (scientific report of 3,000–5,000 words) of the practical activity</b></p>			
	<p>◆ <b>Title, contents page</b></p>	1	1	
	<p>◆ <b>Introduction, aims and objectives</b></p>	4	2	
	<p>◆ <b>Resources/materials and methods</b> Demonstrates appropriate use of one or more types of instrumentation/equipment to a complex level and a high standard (eg using the more advanced features of the instrumentation/equipment competently).</p>	4	2	
	<p>◆ <b>Collation of data</b> Collection of data and appropriate quality.</p>	6	3	

## Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

### Graded Unit Title: Biotechnology: Graded Unit 2

Project Stage	Minimum Evidence Requirements	Maximum mark	Mark Grade C	Mark awarded
Developing continued	<p>◆ <b>Presentation of data</b> Clear and well structured.</p>	2	1	
	<p>◆ <b>Analysis/Interpretation of Data</b> Contains a full analysis of results is accurate and comprehensive.</p>	8	4	
	<p>◆ <b>Sources of error</b> Takes account of all known sources of error and is either substantiated in terms of known theory and/or identifies limitations in theory.</p>	2	1	
	<p>◆ <b>Conclusion and discussions</b> The report has clear and accurate conclusions and recommendations.</p>	5	2	
	<p>◆ <b>Bibliography/references</b> The candidate develops a substantial knowledge base to support the demands of the project evidenced by a wide range of information resources.</p>	4	2	
	<p>◆ <b>Health and Safety Requirements</b> Appropriate Health and Safety Assessments (eg risk, COSHH, Manual Handling). Undertakes all practical activities according to Health and Safety requirements (shows evidence of following risk assessment guidelines) and applies good laboratory practice (record keeping/waste disposal/calibration of equipment) to a high standard.</p>	4	2	
	<p>◆ <b>Level of motivation and initiative</b> Demonstrates a high level of self motivation throughout the project, as evidenced by:</p> <ul style="list-style-type: none"> <li>— Consistently demonstrating initiative.</li> <li>— Sourcing extra information.</li> <li>— Willingness to learn new techniques</li> </ul> <p>The candidate undertakes additional research well beyond that demanded by the project.</p>	2	1	

## Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

### Graded Unit Title: Biotechnology: Graded Unit 2

Project Stage	Minimum Evidence Requirements	Maximum mark	Mark Grade C	Mark awarded
Developing continued	<p>◆ <b>Presentation</b> The report is clear and well structured, contains only relevant information, is technically accurate and uses clear and correct English.</p>	2	1	
	<p>◆ <b>Level of supervision</b> The candidate undertakes the project with the minimum of supervision. Where the candidate feeds back to her/his supervisor it is on a proactive basis, updating the supervisor on progress made and actions for the next stage of the project.</p>	2	1	
	<p>◆ <b>Record of the processes underpinning the practical activity, eg logbook, diary, progress report</b> The diary is regularly maintained and provides a detailed, informal record of results and candidate's thinking as the project develops including reflective comments.</p>	4	2	
	<p>The candidate must achieve all of the minimum evidence specified above in order to pass the developing stage. This will account for 50% of the total mark. If the assessor forms the view that the work finally submitted by the candidate is so weak as to prevent the candidate progressing to the next stage, the candidate may receive additional assistance (over and above the norm). In this event, the assessors will record this fact and the candidate may receive no more than half (25) of the available marks for this stage.</p>	<b>Total 50</b>	<b>Minimum 25</b>	
Evaluating	Evaluation Report which should:			
	<p>◆ <b>Contain an abstract (outline of the assignment)</b></p> <p>◆ <b>Review and update the project brief in light of experience</b></p>	3  3	1  2	

## Higher National Graded Unit specification: Instructions for designing the assessment task and assessing candidates (cont)

### Graded Unit Title: Biotechnology: Graded Unit 2

Project Stage	Minimum Evidence Requirements	Maximum mark	Mark Grade C	Mark awarded
Evaluating continue	<ul style="list-style-type: none"> <li>◆ <b>Summarise any unforeseen events and how they were handled</b> Candidates who did not encounter any unforeseen events should make reference to this in the evaluation.</li> </ul>	4	2	
	<ul style="list-style-type: none"> <li>◆ <b>Identify knowledge and skills which have been gained and/or developed</b> Includes a self-evaluation for what the candidate has learned from undertaking the project. The candidate identifies clear and full details of the new knowledge and skills he/she has developed as a result of doing the project (project management skills, keeping to deadlines, recognising limitations of knowledge — approaching expert sources).</li> </ul>	10	5	
	<ul style="list-style-type: none"> <li>◆ <b>Assess the strengths and weaknesses of the output of the Practical Assignment</b></li> </ul>	4	2	
	<ul style="list-style-type: none"> <li>◆ <b>Determine to what extent the assignment met the original brief</b></li> </ul>	2	1	
	<ul style="list-style-type: none"> <li>◆ <b>Suggest potential development of the project/recommendations for the future</b></li> </ul>	4	2	
	The candidate must achieve all of the minimum evidence specified above in order to pass the Evaluating stage. This will account for 30% of the total mark.	<b>Total 30</b>	<b>Minimum 15</b>	

### 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 assessment arrangements. For information on these, please refer to the SQA document *Guidance on Assessment Arrangements for Candidates with Disabilities and/or Additional Support Needs*, which is available on SQA's website: [www.sqa.org.uk](http://www.sqa.org.uk).

## **General Information for Candidates**

This Unit is project based and is assessed by an investigation that you will carry out using a variety of research methods and tools and the report of that investigation. The topic of research will be left to your choice with advice from your Tutor. This enables you to find out more about an area that interests you particularly and may reflect some developing fields or an interest at your employment.

The project will be marked out of 100. To pass the Graded Unit you must achieve 50% of the total marks and all minimum Evidence Requirements for each of the three sections.

If you achieve an overall percentage of between 50–59% for the Unit you will be awarded a Grade C.

If you achieve an overall percentage between 60–69% for the Unit you will be awarded a Grade B.

If you achieve an overall percentage between 70% and over for the Unit you will be awarded a Grade A.