Next Generation Higher National Unit Specification

Advanced Plant Biology (SCQF level 8)

Unit code: J7A3 48

SCQF level: 8 (24 SCQF credit points)

Valid from: session 2024–25

Prototype unit specification for use in pilot delivery only (version 2.0) August 2024

This unit specification provides detailed information about the unit to ensure consistent and transparent assessment year on year.

This unit specification is for teachers and lecturers and contains all the mandatory information required to deliver and assess the unit.

This edition: August 2024 (version 2.0)

Unit purpose

This unit develops learners' knowledge of plant biodiversity in the context of evolution and adaptation, contextualises mechanisms of plant physiology, advances learners' knowledge of plant breeding principles, and allows them to apply a range of practical laboratory techniques relevant to the topics discussed.

Before starting the unit, learners would benefit from having a foundation knowledge of plant biology, ideally having completed Plant Biology at SCQF level 7, on which this unit expands.

If appropriate, you can integrate the unit with Applied Horticultural Research at SCQF level 8 and Sustainability and Innovation at SCQF level 8.

Unit outcomes

Learners who complete this unit can:

1 interpret plant biodiversity in an evolutionary context
2 investigate plant adaptations to a diverse range of habitats
3 relate plant biology to the principes of plant breeding
4 practice a range of laboratory techniques for plant science

Evidence requirements

Learners must provide the following evidence:

Outcome 1

Learners must gather evidence that demonstrates that they can:

- use appropriate tools to identify a plant or plants
- characterise major horticultural plant families and interpret patterns of evolutionary relationships in these taxa
- describe plant biodiversity and modes of evolution for identified species

Learners' evidence could include a restricted-response assessment, profile and/or case studies, or an e-portfolio.

Outcome 2

Learners must gather evidence that demonstrates that they can:

- describe physiological and morphological adaptations of plants in response to habitat
- examine the tolerance and adaptive strategies of plants to extreme environmental conditions
- identify a range of plants based on their adaptation to habitat using the Raunkiær classification system

Learners' evidence could include a case study, laboratory log, or a presentation.

Outcome 3

Learners must gather evidence that demonstrates that they can relate plant biology to the principles of plant breeding, including:

- characterise the biology of a cell: associated organelles, nucleus, DNA and RNA
- identify the mechanisms of genetics and cell division (mitosis and meiosis)
- explain the mechanisms DNA translation and transcription
- perform combination crosses for F1 and F2 generations, to show dominant and/or recessive allele phenotype expression

Learners' evidence could include a workbook, a laboratory log, or a practical demonstration.

Outcome 4

Learners must gather evidence that demonstrates that they can:

- safely carry out a minimum of three laboratory skills appropriate to plant science
- adhere to all legislative guidelines appropriate for laboratory settings

Learners' evidence could include a laboratory log, a practical demonstration, or recorded media blogs.

Knowledge and skills

The following table shows the knowledge and skills covered by the unit outcomes:

Knowledge	Skills
Outcome 1 Learners should understand: ♦ global plant families and groupings ♦ in-depth plant anatomy relating to structures and organs ♦ evolutionary biology, at an introductory level ♦ a broad overview of the evolution of plants	**Outcome 1** Learners can: ♦ identify a range of plant families and groupings ♦ explain the basic principles of plant evolution ♦ identify adaptive structures in plants, across a range of species
Outcome 2 Learners should understand: ♦ how plants morphologically and physiologically adapt to habitat ♦ different methods of examining plants' tolerance and adaptive strategies to extreme environmental conditions ♦ the Raunkiær classification system and how it is applied in horticulture	**Outcome 2** Learners can: ♦ identify the effects of habitat on plants ♦ apply appropriate skills to examine tolerance and adaptive strategies of plants ♦ identify plants using the Raunkiær classification system
Outcome 3 Learners should understand: ♦ cell biology: ultrastructure, membrane transport ♦ DNA structure, translation and transcription ♦ mechanisms of genetics, cell division and ploidy ♦ plant traits and inheritance (continuation of monohybrid and dihybrid crosses)	**Outcome 3** Learners can: ♦ identify the main structures and organelles of a plant cell ♦ explain the mechanisms of DNA protein synthesis ♦ explain the principles of mitosis and meiosis ♦ produce relevant Punnett squares to demonstrate plant traits and inheritance

Knowledge	Skills
Outcome 4 Learners should understand: ♦ appropriate lab techniques for a range of research in plant diversity and biology ♦ plant cell structures and pollen ultrastructure	**Outcome 4** Learners can: ♦ dissect plant organs ♦ demonstrate practical microscopy (wet and dry techniques) ♦ demonstrate basic DNA extraction ♦ use other laboratory techniques, as appropriate

Meta-skills

Throughout the unit, learners develop meta-skills to enhance their employability in the horticulture sector.

Self-management

This meta-skill includes:

- focusing: safely carrying out laboratory skills appropriate to plant science, and using them for research
- initiative: characterising major horticultural plant families

Social intelligence

This meta-skill includes:

- communicating: explaining how variations in environment and plant management influence physiology; discussing relevant topics
- collaborating: working in groups; participating in class activities

Innovation

This meta-skill includes:

- curiosity: dissecting plant organs; predicting plant population phenotypes
- sense-making: identifying plant families and groupings, and their adaptations to specific environments
- critical thinking: assessing common abiotic and biotic stresses

Literacies

Learners develop core skills in the following literacies:

Numeracy

Learners develop numeracy skills by:

- using laboratory skills and calculations, such as dilutions and concentrations of reagents
- using formulas such as monohybrid and dihybrid crosses, or Punnett squares using Mendelian genetics

Communication

Learners develop communication skills by working in groups, developing projects and discussing related topics.

Digital

Learners develop digital skills and computer literacy by reporting their findings using a range of software applications and platforms. We recommend that you use digital technologies, such as word-processing, spreadsheet and presentation software, to enable authentic assessment.

Delivery of unit

We recommend that you deliver this unit within the limitations of your centre's facilities and resources, focusing on areas of speciality, drawing on areas of centre expertise, and taking advantage of industry contacts where possible, including site visits.

You can integrate delivery of the unit with Applied Horticultural Research at SCQF level 8 and Sustainability and Innovation at SCQF level 8.

The notional design length for the unit is 120 hours. However, the amount of time you allocate to each outcome is at your discretion.

We suggest the following distribution of time, including assessment:

Outcome 1 — interpret plant biodiversity in an evolutionary context (40 hours)

Outcome 2 — investigate plant adaptations to a diverse range of habitats (20 hours)

Outcome 3 — relate plant biology to the principles of plant breeding (20 hours)

Outcome 4 — practice a range of laboratory techniques for plant science (40 hours)

Additional guidance

The guidance in this section is not mandatory.

Content and context for this unit

Where relevant, you should encourage practical application of skills. This should include lab work sessions, in-class practical activities and site visits.

Outcome 1

We recommend that you use live plant material, at different stages of growth where possible, for identification. Visits to botanical gardens or other plant collections help to contextualise biomes and enhance learning.

Outcomes 2, 3 and 4

We recommend that you facilitate practical activities to embed authentic skills and learning where possible, for example carrying out plant trials, laboratory and/or glasshouse practicals. If you cannot provide live practical experience, we recommend visits to appropriate sites.

Health and safety considerations should be central to your delivery of the unit.

Equality and inclusion

This unit is designed to be as fair and as accessible as possible with no unnecessary barriers to learning or assessment.

You should take into account the needs of individual learners when planning learning experiences, selecting assessment methods or considering alternative evidence.

Guidance on assessment arrangements for disabled learners and/or those with additional support needs is available on the assessment arrangements web page: www.sqa.org.uk/assessmentarrangements.

Information for learners

Advanced Plant Biology (SCQF level 8)

This information explains:

- what the unit is about
- what you should know or be able to do before you start
- what you need to do during the unit
- opportunities for further learning and employment

Unit information

You develop your knowledge of plant biodiversity in an evolutionary context and practice a range of laboratory techniques. You contextualise mechanisms of plant physiology and advance your knowledge of plant breeding principles.

In the unit, you:

1 interpret plant biodiversity in an evolutionary context
2 investigate plant adaptations to a diverse range of habitats
3 relate plant biology to the principles of plant breeding
4 practice a range of laboratory techniques for plant science

Before starting the unit, you would benefit from having a foundation knowledge of plant biology, ideally having completed Plant Biology at SCQF level 7, on which this unit expands. You should be provided with supplementary resources to support learning, where possible.

You should actively participate with learning outcome achievement and class activities.

Throughout the unit, you develop meta-skills covering self-management, social intelligence and innovation.

On completion of the unit, and on achievement of the Higher National Diploma (HND), you can progress to the BSc in Horticulture. You may wish to apply directly to the horticulture industry and related work placements.

Administrative information

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Superclass: RH

History of changes

Version	Description of change	Date
2.0	Amended wording of outcomes and associated evidence requirements.	July 2024

Note: please check SQA's website to ensure you are using the most up-to-date version of this document.