

National Unit Specification: General Information

UNIT Plant Structure and Function (Intermediate 2)

NUMBER D883 11

COURSE

SUMMARY

The unit is designed to meet the needs of candidates following a range of programmes and is particularly suitable for the land-based sector. On completion of the unit candidates will be able to describe and solve problems concerning the external and internal features of a typical plant and the relationship of these features to physiological functions enabling the plant to sustain itself in its environment.

OUTCOMES

- 1 Demonstrate knowledge and understanding of plant structure and function.
- 2 Solve problems related to plant structure and function.
- 3 Collect and analyse information obtained by investigation of plant structure and function.

RECOMMENDED ENTRY

While entry is at the discretion of the centre, candidates would normally be expected to have attained one of the following:

- Standard Grade Biology, Chemistry, Geography, Physics or Science at grade 3 or 4
- Intermediate 1 Managing Environmental Resources or its component units.

CREDIT VALUE

1 credit at intermediate 2.

Administrative Information

Superclass: SB

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CORE SKILLS

Information on the automatic certification of any core skills in this unit is published in *Automatic Certification of Core Skills in National Qualifications* (SQA, 1999).

National unit specification: statement of standards

UNIT Plant Structure and Function (Intermediate 2)

Acceptable performance in this unit will be the satisfactory achievement of the standards set out in this part of the unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to the Scottish Qualifications Authority.

OUTCOME 1

Demonstrate knowledge and understanding of plant structure and function.

Performance Criteria

- a) The environmental requirements of plants are identified correctly.
- b) The structure and function of external plant parts are described accurately.
- c) The structure and function of plant cells, tissues and organs are described accurately.
- d) The processes of energy capture, transformation and production in plants are outlined correctly.
- e) The survival strategies of plants are described accurately.

Evidence Requirements

Written and/or oral evidence of the candidate's ability to demonstrate knowledge and understanding of plant structure and function is required. An appropriate level of attainment in a closed book end-of-unit test with items covering all performance criteria could be used.

OUTCOME 2

Solve problems related to plant structure and function.

Performance Criteria

- a) Relevant information is selected and presented in an appropriate format.
- b) Information is processed accurately using calculations where appropriate.
- c) Conclusions drawn are valid and explanations given are supported by evidence.
- d) Predictions and generalisations made are based on available evidence.

Evidence Requirements

Evidence of an appropriate level of attainment must be generated with information covering all performance criteria. Evidence for Outcomes 1 and 2 could be generated from an integrated end-of-unit test.

National unit specification: statement of standards (cont)

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OUTCOME 3

Collect and analyse information obtained by investigation of plant structure and function.

Performance Criteria

- a) Information is collected by active participation in the investigation.
- b) Investigative procedures are described accurately.
- c) Relevant measurements and observations are recorded in an appropriate format.
- d) Recorded information is analysed and presented in an appropriate format.
- e) Conclusions drawn are valid.
- f) Procedures are evaluated with supporting argument.

Evidence Requirements

Evidence of an appropriate level of attainment must be generated with items covering all performance criteria. One report of an investigation into an aspect of plant structure and function is required. The report must be the individual work of the candidate and be based on an investigation in which the candidate has demonstrated an acceptable level of participation. Depending on the activity, the collection of the information may involve group work.

National unit specification: support notes

UNIT Plant Structure and Function (Intermediate 2)

This part of the unit specification is offered as guidance. None of the sections of the support notes is mandatory.

GUIDANCE ON CONTENT AND CONTEXT

This unit should be delivered within the appropriate context for the particular candidate group. Care should be taken, however, to ensure that a suitable balance is achieved and that, for example, agriculture candidates do not consider only monocot. species and that forestry candidates do not consider only conifers.

- 1 Environmental requirements of plants should be restricted to factors required for normal growth and development. The range of temperatures supporting growth and the relationship between growth rate and temperature should be covered. Requirements for oxygen, carbon dioxide and, in some cases, nitrogen gas should be explained. Mineral nutrient requirements should focus on the major elements and discussion of water relations should be restricted to osmosis at the cellular level and drought resistance/susceptibility at the whole plant level. The light requirement for photosynthesis should be included but mention could also be made of photoperiodism.

The external morphology of plants should relate structures to functions and should include roots, stems, buds and leaves as a minimum and other features such as root nodules, thorns, tendrils, stipules, flowers, fruits and seeds, as appropriate.

Meristematic cells and examples of relatively unspecialised mature cells (such as parenchyma cells) and specialised mature cells (such as vessels or sieve tubes) should be covered as a minimum. The structures and functions of tissues could be restricted to xylem, phloem and storage tissue. The distribution of tissues in roots, stems and leaves should be considered from the point of view of an efficiently functioning plant.

Energy relationships could be considered from the perspective of a plant's requirement for adenosine triphosphate (ATP). The requirements for light, carbon dioxide from the air and water from the rooting medium via the transpiration stream for photosynthesis and the photosynthetic product which is then transformed to sucrose for translocation throughout the plant offers a relatively simple way to present this part of the unit and also allows integration of anatomy and physiology. This approach can be extended to include storage of energy, usually in the form of starch in perennation organs and seeds, and the release of energy in a chemically active form (ATP) through respiration for the maintenance or organisation and growth.

National unit specification: support notes (cont)

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Survival strategies could include seed production, vegetative propagation, dormancy, deciduous and herbaceous habits, perennation organs, annual, biennial, and perennial lifestyles and other widespread features. The use of animals for pollination and fruit or seed dispersal and the various strategies to protect plants from herbivores could be included if considered appropriate. Similarly, the more specialised adaptations of hydrophytes and xerophytes could be included.

- 2 Numerous situations arise during the delivery of Outcome 1 for problem solving exercises. Outcome 2 could therefore be completely integrated with Outcome 1.
- 3 Likewise Outcome 3 could be completely integrated with the previous outcomes. Simple physiological experiments could be particularly suitable here. Investigations of osmosis, respiration, photosynthesis, translocation, transpiration and etiolation could all lend themselves to laboratory-based practical work which could then be written up. Active participation in, and a satisfactory report of, any one investigation could then be used to provide the assessment evidence for Outcome 3.

GUIDANCE ON TEACHING AND LEARNING APPROACHES

Although some formal teaching sessions may be required to introduce plant morphology, anatomy and physiology, as much of this unit as possible should involve a strongly candidate-centred approach. Video material may be appropriate for particular aspects. An investigative approach should be used wherever possible with candidates learning from their own experiences.

Delivery should be appropriate to the needs of individual candidate groups. This may be achieved by considering the plant as a system for generating the required product, for example, wood for forestry candidates, grain or grass for agriculture candidates and flowers or ornamental foliage for horticulture candidates.

GUIDANCE ON APPROACHES TO ASSESSMENT

Centres may use the instruments of assessment which are considered by teachers/lecturers to be the most appropriate. An integrated assessment in the form of an end-of-unit test with questions covering all of the performance criteria could be used for Outcomes 1 and 2. Outcome 3 can be assessed by participation in a practical investigation and an appropriate level of attainment in the associated report.

SPECIAL NEEDS

This unit specification is intended to ensure that there are no artificial barriers to learning or assessment. Special needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments or considering alternative outcomes for units. For information on these, please refer to the SQA document *Guidance on Special Assessment and Certification Arrangements* (SQA, 1998).