Higher National Unit specification

General information for centres

Unit title: Plant Classification and Systematics

Unit code: F1MR 35

Unit purpose: An appreciation of the diversity of plants is a fundamental part of using them in horticulture. Key to this understanding is an ability to identify the plants and understand the ways in which they are classified. This Unit allows the candidate to draw together knowledge of horticulturally important plants and place this in the context of plant biodiversity as a whole. Covering bryophytes, ferns and gymnosperms, an extensive overview of the flowering plants and a look at allied groups such as the fungi and lichens, this Unit introduces students to the key characters that define these groups. At least twenty plant groups (taxa or paraphyletic groups) of core horticultural importance will be studied through the course. The character-based approach to plant classification allows candidates to develop plant identification skills that can be applied to any new plant they encounter. The Unit also covers methodologies used by botanists and taxonomists to classify these organisms and the value to society of such classification schemes. Evolutionary relationships will be highlighted, as will commonalities in ecological preferences and cultivation strategies.

On completion of the Unit the candidate should be able to:

1 Effectively use the range of resources available within science and horticulture for understanding plant biodiversity.
2 Explain the rationale behind the classification of plants and apply the methods used in their classification.
3 Characterise major horticultural plant families and interpret patterns of evolutionary relationships in these taxa.
4 Apply acquired knowledge to the identification and cultivation of plants.

Credit points and level: 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.*

Recommended prior knowledge and skills: It would be advantageous for students to have a basic appreciation and knowledge of the concept of taxonomy, its hierarchical structure and its purpose in grouping related organisms. Any practical experience or personal observation of the diversity of plants available in horticulture or in the wild will be very valuable. The SCQF level 7 Unit F215 34 *Horticulture: Plant Recognition and Use* provides a good grounding in horticultural plant diversity.

General information for centres (cont)

Core Skills: There are opportunities to develop the Core Skills of Problem Solving and Communication at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Context for delivery: If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

Assessment: Outcomes 1 and 2 should be assessed by group presentations on a horticulturally significant plant family not encountered in the taught portion of the class. A half-day seminar would afford the opportunity for five groups of students to give 20 minute presentations on a plant family. Presentations would be required to show where in the Plant Kingdom the family is to be found, as well as discussing the general horticultural requirements of the family.

Outcome 3 should be assessed by a portfolio of the c. 20 plant taxa (mainly horticulturally important plant families) encountered through the taught portion of the class. The portfolio should consist of technical botanical drawings annotated to show the key characteristics that define the plants and allow them to be identified. Candidates should be encouraged to show the diversity within each plant group, as well as emphasising the commonalities between members of the group. Additional images (eg photographs), and marginal notes on the plant families or groups would be valuable additions.

Outcome 4 should be assessed as a series of plant identification tests throughout the Unit, to include a mixture of identifications to cultivar, species, genus and family levels depending on the examples used. In some cases, students should be tested on their ability to use keys to identify unknown plants.

Given the huge range of plant families available to the horticulturist, centres would expect to provide teaching on groups of plants that are readily available as living or fresh material for study by the students. However, all centres should aim to include at least the following groups:

- Mosses and Ferns
- Gymnosperms
- Asteraceae (Compositae)
- Ericaceae
- Fabaceae (Leguminosae)
- Lamiaceae (Labiateae)
- Ranunculaceae
- Rosaceae
- Liliaceae and allies (eg Alliaceae)
- Poales (grasses, rushes, sedges and allies)

Higher National Unit specification: statement of standards

Unit title: Plant Classification and Systematics

Unit code: F1MR 35

The sections of the Unit stating the Outcomes, Knowledge and/or Skills, and Evidence Requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Effectively use the range of resources available within science and horticulture for understanding plant biodiversity

Knowledge and/or skills

- Plant biodiversity
- Research skills
- Evaluating the accuracy, validity and relevance of secondary sources
- Standard textbooks, specialist books on the family
- Scientific papers
- The internet, databases and other electronic media

Where appropriate, candidates will also be able to apply their own knowledge of plants, including primary experience of observing, cultivating and using the family, as well primary observations of plants dissected for drawing.

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- investigate plant diversity (using a single plant family as a model)
- gather information efficiently
- gather accurate information

Assessment guidelines

This Outcome should be assessed by a library/internet research exercise, either individually or in groups. It could be presented as:

1 A group research project, presented to the assessor (and potentially fellow candidates) as a talk or conference-style poster.

OR

2 A short individual report (maximum 1,000 words).

In either case, extensive use of accurate, appropriate images should be made, examples including:

- distribution maps
- images of the plants — whole, in habitat, in cultivation, dissected parts etc

Where relevant, sources should be cited.

Outcome 2

Explain the rationale behind the classification of plants and apply the methods used in their classification

Knowledge and/or skills

- Importance of plant classification
- Botanical taxonomic hierarchy
- Methods of classifying plants, to include:
  - The distinction between artificial, natural, morphological and molecular phylogenetic (particularly DNA-based) classifications
  - The importance of characters in defining taxonomic groups

Evidence Requirements

Candidates will need evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- interpret the place of plant families or other plant taxa in the broader scheme of plant biodiversity
- place plant groups (taxa) in the appropriate place in the taxonomic hierarchy
- place some of the characteristics of major groups of plants in an evolutionary context, giving an indication of how ‘primitive’ or ‘advanced’ certain key characteristics are (eg flowers are ‘more advanced’ than cones)
- use taxonomic names (including binomials and cultivar names) accurately

Assessment guidelines

This Outcome should be assessed in conjunction with Outcome 1, via a library/internet research exercise, either individually or in groups.

Outcome 3

Characterise major horticultural plant families and interpret patterns of evolutionary relationships in these taxa.

Knowledge and/or skills

- The important identifying characters for key groups of plants. Groups should include:
  - Bryophytes (mosses and liverworts)

- — Pteridophytes (ferns and horsetails)
- — Lichens
- — Gymnosperms
- — Flowering plants from at least **sixteen** families, to include at least:
- — Compositae (Asteraceae), Ericaceae; Leguminosae (Fabaceae), Labiateae (Lamiaceae); Rosaceae; Ranunculaceae Liliaceae and allies (eg Alliaceae), and Poales (Poaceae and allies)

- ♦ Plant characters that may be of taxonomic interest,
- ♦ Names and descriptions of plant parts
- ♦ How lifestyles, geographical distribution and wild habitats of plants influence successful cultivation strategies
- ♦ Botanical line drawings (technical rather than artistic)

Evidence Requirements

Candidates will need to provide evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- ♦ make close, deconstructive observations of plants
- ♦ draw and annotate a clear, concise botanical diagram, showing scale
- ♦ summarise the key characters that define a given plant family from among those studied
- ♦ explain the commonalities between members of taxonomic groups in terms of cultivation requirements and horticultural uses

Given the size of the Plant Kingdom, where gaps are apparent in the candidate's knowledge of a particular family the candidate should be able to suggest where the relevant information can be found (see Outcome 1).

Assessment guidelines

Candidates should create a portfolio including technical botanical drawings of at least 20 different plant groups. These should include at least one member from each of the plant groups outlined in Knowledge/Skills above (not less than 20 in total).

The purpose of the portfolio is to illustrate the key characteristics of the plant group, as well as summarising the group's diversity. Reproductive structures will be the main focus of most of the drawings. The correct identification and accurate description of characters or combinations of characters that define groups will be of primary importance.

Focus should be on the clarity and accuracy of information conveyed (ie good diagrammatic representations) and less on the artistic or realistic qualities of the diagrams.

Higher National Unit specification: statement of standards (cont)

Unit title: Plant Classification and Systematics

Outcome 4

Apply acquired knowledge to the identification and cultivation of plants.

Knowledge and/or skills

- Close observation of plants, including a deconstructivist method of approaching plant characters
- General understanding of plant anatomical terminology
- The ability to use taxonomic keys for the identification of plants
- Spot identification of many plant species

Evidence Requirements

Candidates will need evidence to demonstrate their Knowledge and/or Skills by showing that they can:

- identify a wide range of plants in 'plant ident' sessions
- use keys to identify plants

Given the size of the Plant Kingdom, where gaps are apparent in the candidate's knowledge of a particular family the candidate should be able to suggest where the relevant information can be found (see Outcome 1).

Assessment guidelines

This Outcome should be partly assessed with the plant portfolio described for Outcome 3 above. The Evidence Requirements for this Outcome will be based on groups of plants that candidates have seen in class. Their observations and notes in the plant portfolio assessment will demonstrate that candidates can apply a deconstructivist, character-based approach to plant identification.

Higher National Unit specification: statement of standards (cont)

Unit title: Plant Classification and Systematics

The main assessment for this Outcome should be a series of unseen plant identification assessments ('plant idents'). This would encourage candidates to learn a great diversity of plants within the plant groups studied. Centres should aim to cover >250 species, cultivars, or representatives of families over the course. This is perhaps best assessed as a series of assessments covering >10 plants per week, with candidates having been introduced to the plants the previous week, or earlier in the course.

Such assessments should be unseen, closed-book tests. In general, candidates should be expected at this level to know family, genus, species and wild distribution.

Some variations on this theme should be allowed such that some sessions may assess the candidate's understanding of keys by allowing them to use a family key to identify plants (to family level) from rare or odd families that the candidates had never yet encountered.

Administrative Information

Unit code: F1MR 35

Unit title: Plant Classification and Systematics

Superclass category: RH

Original date of publication: August 2007

Version: 01

History of changes:

Version	Description of change	Date

Source: SQA

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

Additional copies of this Unit specification can be purchased from the Scottish Qualifications Authority. Please contact the Customer Contact Centre for further details, telephone 0845 279 1000.

Higher National Unit specification: support notes

Unit title: Plant Classification and Systematics

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 80 hours.

Guidance on the content and context for this Unit

This Unit gives candidates:

1 An overview of the enormous diversity of the Plant Kingdom and an understanding of the relationships between plant groups across the Kingdom.
2 The ability to recognise and identify a large number of horticulturally important plant taxa.
3 An awareness of taxonomy and the taxonomic method, as well as an appreciation of how classifications have changed in recent years to reflect DNA-based evolutionary relationships.
4 The tools to identify plants, including:
   - ♦ close observation of plant characters
   - ♦ where to look for keys and descriptions of plants and how to use them
   - ♦ an ability to assess the reliability of an identification.
5 Skills in technical botanical drawing, and close observation, to include microscopy where facilities are available.

Outcome 1 should emphasise the tremendous wealth of resources available for understanding plant relationships and for identifying plants. Students should be encouraged to make use of all resources and evaluate the quality of resources. On a simple level, provision of a fairly comprehensive reading list, and list of recommended websites will introduce students to the resources available.

Outcome 2 should ensure that candidates gain a good grounding in the principles of classification. An understanding of the binomial and hierarchical system of classification can be gained throughout the course. The initial theory and overall structure are best introduced in one or two lectures, however, the principles should be applied throughout the course.

Throughout the course that candidates use taxonomic names correctly, with the correct syntax (letter cases, italics etc). Throughout any study of plants, or practical experience with named plants, candidates will come across taxonomic names used in many different ways. Correct practice should be used by people delivering learning in order to encourage this is candidates. As a part of their research exercise into a given plant family, candidates should be required to demonstrate that they could place the family in the wider hierarchy of the plant kingdom by:

♦ listing the family in a hierarchical listing with appropriate syntax

Kingdom
Phylum
Class/Subclass Order*
Family*
*Genus**
*species**

(*These are the most important taxonomic levels for this course)

- identifying the position of the family on a phylogenetic tree, such as the APG II tree
- throughout, candidates should use taxonomic names correctly, with the correct syntax

Outcomes 3 and 4 should consist of an overview focussing on horticulturally important plant groups including a range of Angiosperm families. The intention is to familiarise candidates with the plant groups, helping them to recognise the groups in future. In addition, this format will encourage students to deconstruct plant taxa into their component key characters, a fundamental skill when identifying unknown plants.

The course should introduce these skills using large numbers of species and cultivars as models. Consequently, candidates will greatly expand their plant knowledge and recognition skills at the species and cultivar levels. This wide plant knowledge is fundamental to a successful career in any facet of horticulture and allied disciplines. If possible candidates should see specimens in life — either within the grounds of the providing centre, or at nearby places with rich collections of plants.

Guidance on the delivery and assessment of this Unit

This Unit is likely to form part of a Group Award, which is primarily designed to provide candidates with technical or professional knowledge and skills related to occupations in nurseries, botanic gardens, historic heritage gardens and amenity horticulture. Plantsmanship students will need to relate information learned in this Unit to the requirements of the Graded Unit.

Learning should exploit a wide variety of delivery styles:

- for some core elements such as the history and theory of taxonomy and classification, lecture a format is perhaps most appropriate. Topics should include at least:
  — nomenclature and the taxonomic hierarchy
  — classification — ways of classifying in the plant Kingdom
  — using identification keys.
- self-led study in libraries, on the internet, and first-hand interactions with living and herbarium collections. This will encourage students to appreciate and make use of the full range of materials available within plant taxonomy.
- when investigating plant diversity and structures, candidates should use real plants at all opportunities. Learning methods include close observation of:
  1 Living specimens, particularly in a horticultural context.
  2 Freshly gathered material dissected and observed under magnification with low power microscopes and/or ×10 hand lenses. These collections in particular would form the basis for the plant portfolio of technical botanical drawings.
  3 Preserved specimens from herbaria or other archival collections.

These observations of real plants will enable candidates to increase their plant knowledge and recognition skills throughout the course. As well as encountering plants during introductions to families and practical sessions, time should be devoted to showing candidates an extensive range of plant species and cultivars. These would then form the basis of the ‘plant identification’ assessments. If there are insufficient collections on-site then material may be readily bought in from commercial florists. Visits to taxonomic research institutes would be very valuable (the royal botanic gardens at Edinburgh and Kew, and the Natural History Museum, London are the UK’s largest).

Higher National Unit specification: support notes (cont)

Unit title: Plant Classification and Systematics

The appropriate vocabulary used to describe the plants and plant parts accurately should also be given to the candidates. Emphasis should also be placed on physiological requirements, geography and habitat preferences of the plants.

Throughout the course, candidates should attempt to place any plants they encounter in the context of the wider Plant Kingdom, allowing their observations to lead them to form theories of relationships. Because of this, it would be ideal for some of the sessions to introduce plant groups that are not taxonomic, but can be artificially classified based on a common character. Thus one session might cover tree families traditionally believed to be closely related for their supposed wind pollination syndrome (eg Betulaceae, Fagaceae and Salicaceae).

It is important that candidates also have the opportunity to look at fungi and lichens for context, ideally over the course of at least a 2 hour session for each group.

The following texts may be helpful in the delivery of this Unit:

Botanical Terminology:

- Hickey M. & King C. (2000), '*The Cambridge Illustrated Glossary of Botanical Terms.*' Cambridge University Press, Cambridge
- Harris J.G. & Harris M.W. (2000), '*Plant identification terminology*' (Second edition) Spring Lake, Utah
- Hickey M. & King C. (2000), '*Common families of flowering plants*' Cambridge University Press, Cambridge
- Stella Ross-Craig's '*Drawings of British Flowers*' series (widely upheld by many as one of the best series of botanical drawings there is)

Family level information:

Many of these books still arrange families according to the old Bentham and Hooker or similar morphology-based classification systems:

- Baumgardt J (1982), '*How to identify flowering plant families*' Timber Press, Portland, Oregon
- Heywood V. (ed.) (1978), '*Flowering plant families of the World*' Oxford University Press, Oxford. (second edition 1993, Andromeda books, Oxford)
- Hickey M. & King C. (2000), '*Common families of flowering plants*' Cambridge University Press, Cambridge
- Mabey R. (2003), '*The plant book*' Cambridge University Press, Cambridge
- Simpson M.G. (2006), '*Plant systematics*' Elsevier, Amsterdam. This is the most up-to-date book on this topic, taking account of major recent changes in the classification of plants based on DNA studies. It also has an extensive glossary of plant terminology. However it is perhaps a little too broad as a textbook for this course alone.

Others:

- Capon B. (2005), '*Botany for Gardeners*' Timber Press, Portland
- Marinelli J. (ed.) (2004), '*Plant Dorling Kindersley*', London.

Opportunities for developing Core Skills

There are opportunities to develop the Core Skills of Problem Solving and Communication at SCQF level 6 in this Unit, although there is no automatic certification of Core Skills or Core Skills components.

Open learning

Most elements of all Outcomes of this Unit could be delivered by distance learning depending on candidate access to a range of plant collections, library and computing facilities. Microscopes, while useful are not essential, and many close observations can be made with a ×10 hand lens. The practical elements are well supported by the ready, year-round availability of horticulturally important plants in gardens, garden centres, florists etc. Centres offering the course would be required to suggest readily available, inexpensive sources of plant material, as well as recommended plants to illustrate the diversity of a given family or other group of plants.

eg Ericaceae (the heath family):

- Rhododendron flower, Rhododendron leaf (2 species with different leaf undersurfaces), Rhododendron capsule
- Erica or Calluna flower, Erica or Calluna capsule (heathers)
- Vaccinium berry (blueberry, cranberry etc)

Alternative flowers: *Arbutus* or *Pieris*

Candidates would be required to make unequivocal identifications to whatever taxonomic level possible, and would be encouraged to select material that they can identify to species level where possible. This would depend on circumstances and source of the material.

In the Ericaceae example above, candidates should be expected to research and discover the taxonomic name of the cultivated blueberry, and provide a listing of several commonly available cultivars.

Candidates would need to attend the centre at the beginning of the course in order to gain practical experience in microscope or hand-lens use, and the basic skills required for accurate dissection and drawing of plants. For further guidance on open learning, please refer to the SQA document, *Assessment and Quality Assurance for Open and Distance Learning* (*SQA, 2000*)

Candidates with disabilities and/or additional support needs

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

General information for candidates

Unit title: Plant Classification and Systematics

This Unit is designed to provide you with a solid grounding in plant biodiversity, identification and the ways in which plants are classified. You will be provided with practical skills in plant identification using a wide range of important wild and cultivated plant groups. Throughout the course you will be looking at the patterns of diversity that link some groups of plants together and keep them distinct from others. Although the main focus is on flowering plant families we will also investigate the mosses, ferns, fern allies and gymnosperms, as well as the lichens and fungi.

In order to learn these skills, you will look at a very wide range of horticulturally important plants and have the opportunity to increase your plant knowledge and recognition skills.

Theoretical elements include an introduction to nomenclature, taxonomy and the various methods used to classify plants. We will also place the plant groups we investigate in a wider evolutionary context to give an overview of this incredibly diverse and fascinating Kingdom.

In order to complete this Unit successfully, you will be required to achieve a satisfactory level of performance in three pieces of assessed work; a group presentation investigation into a plant family; a plant portfolio of drawings and observations on key groups of plants, and a series of plant identification tests throughout the course of the Unit.