



RHS LEVEL 3 ADVANCED/DIPLOMA IN HORTICULTURE WRITTEN EXAMINATION

2:00pm Wednesday 10th February 2010

MODULE J

Establishment & Maintenance of Decorative Ornamental Turf Plant Selection, Establishment & Maintenance Hardy Ornamental Nursery Stock

Section A – Short Answer Questions

Candidate Number:.....

Candidate Name:.....

Centre Number/Name:.....

IMPORTANT – Please read carefully before commencing.

- i) The duration of the papers in Module **J** is **2 hours**.
- ii) Answer **ALL** questions in Section **A**.
- iii) **ALL** questions in Section **A** carry equal marks.
- iv) Write your answers legibly in the spaces provided.
- v) Use **METRIC** measurements **ONLY**.
- vi) Where plant names are required, they should include genus, species and where appropriate cultivar.

Please turn over/.....

ANSWER ALL QUESTIONS

MARKS

- Q1** State, using **NAMED** examples, **TWO** characteristics of plants suitable for winter display.

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- Q2** For a **NAMED** region in the United Kingdom and for a **NAMED** half-hardy bedding plant raised from seed; state when it should be:

- i) sown;
- ii) planted out.

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- Q3** Name **TWO** free-floating aquatic plants for an ornamental pool.

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- Q4** State **FOUR** characteristics of an outdoor seedbed for conifer production.

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Please see over/.....

ANSWER ALL QUESTIONS

MARKS

- Q5** List **FOUR** management techniques used in order to maximise production for a nursery stock bed. **2**

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- Q6** List **FOUR** criteria when grading a batch of liners for growing on. **2**

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- Q7** List **FOUR** autumn operations that could be carried out to aid the recovery of the sward in an over used play area. **2**

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Please turn over/.....

ANSWER ALL QUESTIONS

MARKS

- Q8** Describe for a **NAMED** perennial weed in turf, **TWO** appropriate cultural controls.

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- Q9** a) State **TWO** hazards for others that may be encountered when using a rotary mower in a public place.

- b) Describe for each hazard a precaution to reduce the risk.

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- Q10** Specify a grass seed mix suitable for a lawn in a shady situation.

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MODULE J

**Establishment & Maintenance of Decorative Ornamental Turf
Plant Selection, Establishment & Maintenance
Hardy Ornamental Nursery Stock**

Sections B, C & D - Structured Questions

IMPORTANT – Please read carefully before commencing.

- i) The duration of the papers in Module **J** is **2 hours**.
- ii) Answer **ONE** question only from **EACH** of the sections **B, C** and **D**.
- iii) **ALL** questions carry equal marks.
- iv) Write your answers legibly in the answer booklets provided.
- v) Use **METRIC** measurements **ONLY**.
- vi) Where plant names are required, they should include genus, species and where appropriate cultivar.

Please turn over/.....

Section B – Establishment & Maintenance of Decorative Ornamental Turf

Answer **ONE** question only from this section

	MARKS
Q11 a) Explain the processes involved in the production of a new area of fine lawn from seed.	10
b) State FOUR effects of a compacted soil on the establishment of a new lawn.	4
c) State the uses of EACH of the following tines on established turf: i) slit; ii) solid; iii) hollow.	6
Q12 a) Describe TWO different drainage systems used for amenity turf, with the aid of clearly labelled diagrams.	12
b) Describe the factors that affect the efficiency of water removal for these drainage systems described in a).	8

Please see over/.....

Section C – Plant Selection, Establishment & Maintenance

Answer **ONE** question only from this section

		MARKS
Q13	a) Describe an annual maintenance programme for an established rock garden.	12
	b) Name and describe TWO suitable plants from different genera, for EACH of the following:	
	i) scree bed;	
	ii) alpine trough.	8
Q14	a) Describe an annual maintenance programme for a herbaceous island bed.	12
	b) Describe how to renovate a bed containing EACH of the following:	
	i) <i>Aster x frikartii</i> 'Monch';	
	ii) <i>Hosta fortunei</i> ;	
	iii) <i>Delphinium</i> ;	
	iv) <i>Papaver orientale</i> .	8

Please turn over/.....

Section D – Hardy Ornamental Nursery Stock

Answer **ONE** question only from this section

MARKS

- Q15** Evaluate the use of **EACH** of the following, in relation to the production of hardy ornamental nursery stock:
- | | | |
|------|-------------------------|---|
| i) | mist propagation unit; | 4 |
| ii) | contact polythene; | 4 |
| iii) | micro-propagation unit; | 4 |
| iv) | plastic clad tunnel; | 4 |
| v) | cold frame. | 4 |
- Q16** a) Evaluate the physical and chemical properties of **FOUR** bulky ingredients that may be used in nursery stock compost.
- 16**
- b) Identify **FOUR** hazards and the associated risks when using composts.
- 4**

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MODULE J

Establishment & Maintenance of Decorative Ornamental Turf Plant Selection, Establishment & Maintenance Hardy Ornamental Nursery Stock

Candidates Registered	95		Total Candidates Passed	75	94.94%
Candidates Entered	79	83.16%	Passed with Commendation	28	35.44%
Candidates Absent	12	12.63%	Passed	47	59.50%
Candidates Deferred	4	4.21%	Failed	4	5.06%
Candidates Withdrawn	0	-			

Section A – Short Answer Questions

Q1 State, using **NAMED** examples, **TWO** characteristics of plants suitable for winter display.

Characteristics expected were winter flowers, ornamental bark or foliage etc. Candidates cited a wide range of plants, mostly shrubs but some also named winter bedding. Marks were awarded for correctly spelt examples.

Q2 For a **NAMED** region in the United Kingdom and for a **NAMED** half-hardy bedding plant raised from seed; state when it should be:

- i) sown;
- ii) planted out.

Marks were awarded for a correctly named bedding plant that included both the genus and species or cultivar.

- i) Stating a particular month suited to sowing, rather than for giving a wide time range over two months was rewarded.
- ii) Most candidates correctly opted for the last week of May to the first week of June for planting out, although the correct time for each district was noted, as were references to 'after the threat of frost' and to taking notice of the weather forecast.

Q3 Name **TWO** free-floating aquatic plants for an ornamental pool.

Correctly spelt examples gained marks. *Stratiotes aloides* and *Trapa natans* proved the most popular choices. Some candidates failed to appreciate that the examples had to be free floating.

Q4 State **FOUR** characteristics of an outdoor seedbed for conifer production.

Most candidates' answers included: a free draining, light sandy loam, pH 5.0-6.5, with good moisture retention. Many candidates stated that it should be in an open sunny position, sheltered from the wind. An adequate clean water supply was also mentioned. Some candidates wrote of the need for inducing mycorrhizal activity and others named or described a Dunemann bed. All were rewarded.

Q5 List **FOUR** management techniques used in order to maximise production for a nursery stock bed.

Some candidates confused nursery stock with stock plants. The best answers included testing soil for nutrient status and correcting any deficiencies, ascertaining the pH was correct for the plants grown, providing windbreaks, applying irrigation as necessary for optimum growth and ensuring the irrigation water was free of pathogens.

Also rewarded was the need for observation for pest and disease and their control, the creation of bed systems to allow access for husbandry and machinery, and to reduce soil compaction by using pathways.

Using material removed during formative pruning to create plants for the next crop also gained marks.

Q6 List **FOUR** criteria when grading a batch of liners for growing on.

The concept of a liner as a small immature plant was not always apparent. Candidates who indicated grading was to produce uniform batches of liner plants for sale, or to grow on to later sell at maturity, were rewarded. Marks were given for listing the need to assess for well-developed root systems, sturdy compact shoots, plants of similar size and vigour massed in the same group, and freedom from visible signs of pests and diseases. None of the candidates cited the need for liners to be dealt with promptly to prevent drying out.

Q7 List **FOUR** autumn operations that could be carried out to aid the recovery of the sward in an over used play area.

The candidates variously appreciated the need to aerate the soil by hollow tine and/or slitting, with a free draining top-dressing brushed in afterwards. Some candidates suggested taking the area out of use which, while not strictly an 'autumn operation' was sufficiently sensible to reward.

Many correctly mentioned over-sowing with a rye grass based seed mixture or applying an autumn fertiliser with low nitrogen but high potassium and phosphate content.

Q8 Describe for a **NAMED** perennial weed in turf, **TWO** appropriate cultural controls.

A correctly spelt turf weed was rewarded. The usual control suggested was removal of the total root system of a perennial weed and improving the growing conditions of the grass by improving drainage, improved nutrition, and irrigation. Other ideas included scarifying before mowing, to bring up the leaves or runners, or use mowing to chop off the flower heads to reduce incidence of further seeding. This was rewarded if the plant was tall enough but not where the flowers or leaf rosettes of the named weed would be below the height of cut.

- Q9** a) State **TWO** hazards for others that may be encountered when using a rotary mower in a public place.
- b) Describe for each hazard a precaution to reduce the risk.

The hazard most often stated was the mower throwing stones from under the hood, therefore the need to check for and remove loose debris from the area before mowing.

Other hazards that may involve injury to the public, damaging feet or hands, tampering with a stationary machine, or the fire hazard associated with fuel, with the precaution correctly emphasised that mowers should never be left unattended.

The mower blowing dusty soil into the atmosphere in dry weather, exacerbating lung conditions, was not given so frequently e.g. do not mow dry dusty areas until after rain or irrigation has laid the dust.

- Q10** Specify a grass seed mix suitable for a lawn in a shady situation.

Mixes including fescues, with the addition of any of the following: *Poa nemoralis*, *P.trivialis*, *Phleum bertolonii*, *Cynosurus cristatus* gained marks. Where only fescues associated with bents or perennial rye grass were given, as found in a standard or basic lawn mix, no marks were gained.

Sections B, C & D – Structured Questions

Section B – Establishment & Maintenance of Decorative Ornamental Turf

- Q11**
- a) Explain the processes involved in the production of a new area of fine lawn from seed.
 - b) State **FOUR** effects of a compacted soil on the establishment of a new lawn.
 - c) State the uses of **EACH** of the following tines on established turf:
 - i) slit;
 - ii) solid;
 - iii) hollow.

This question was answered by the majority of candidates and was answered fairly well on the whole. For maximum marks the answers should have been set out in a logical order covering points such as removal of vegetation, dealing with compaction and drainage and ensuring a sufficient depth and quality of topsoil to sustain growth.

Preparation of the soil before sowing is extremely important as grass is a permanent crop and it is difficult to put things right once established.

Where organic matter is added it needs to be well rotted and well mixed with the soil to avoid sinkage. In a few cases mention was made of using organic fertilisers such as dried blood which is not a good idea prior to sowing.

- Q12**
- a) Describe **TWO** different drainage systems used for amenity turf, with the aid of clearly labelled diagrams.
 - b) Describe the factors that affect the efficiency of water removal for these drainage systems described in a).

This question is an important element of establishing and maintaining ornamental turf, yet few candidates attempted this question. A sound understanding of drainage methods is required for amenity turf.

Part a) asked for a description of two different types of drainage systems for amenity turf with clearly labelled diagrams. This part of the question was worth 12 marks, therefore it was important for candidates to express their knowledge well as it was worth 60% of the total marks. The two most popular responses were pipe drainage and French drains. It was vital to support the written responses with clearly annotated diagrams to gain the high marks being awarded. For pipe drainage, it was important to describe that it was the main drain which is laid to a minimum fall of 1 in 200, but significantly that lateral drains feed in to it. Conversely, French drains are laid without pipe-work and are open to the surface from which to collect water, which in turn feeds a suitable outlet. Both systems are very distinctive and good descriptive answers were required.

The second part of the question, part b), asked for the factors that affected the efficiency of water removal for the drainage systems described in a). Candidates in order to score highly needed to describe such aspects as the fall of the land, the type of soil for porosity and permeability, the condition of the soil, spacing of the drainage, the fall of the drainage system, the efficiency of backfill and a positive outlet.

Section C – Plant Selection, Establishment & Maintenance

- Q13** a) Describe an annual maintenance programme for an established rock garden.
- b) Name and describe **TWO** suitable plants from different genera, for **EACH** of the following:
- i) scree bed;
 - ii) alpine trough.

Part a) required candidates to present cultural activities in an orderly manner. Candidates scoring well in this section generally took one of two approaches. Cultural activities could be grouped season by season, for example spring activities would include top up with grit, plant/transplant, feed, divide. Alternatively each activity could be dealt with separately but reference would be made to the optimum time of year to carry out the task. Whichever method was chosen it was necessary to describe the task and not just produce lists/bullet points. For example – feeding is carried out in spring, avoid a high nitrogen type, keep granules/powder off the foliage, apply before topping up grit.

Part b) required plants to be recommended for two different features. Candidates scoring well in this were able to name a plant accurately and describe significant features. For example: Alpine trough - *Pulsatilla vulgaris* - produces pale purple flowers in May followed by silky seed heads and ferny foliage.

- Q14** a) Describe an annual maintenance programme for a herbaceous island bed.
- b) Describe how to renovate a bed containing **EACH** of the following:
- i) *Aster x frikartii* 'Monch';
 - ii) *Hosta fortunei*;
 - iii) *Delphinium*;
 - iv) *Papaver orientale*.

Part a) required candidates to present maintenance/cultural tasks in a logical/structured manner, very similar to the previous question which dealt with alpiners. As before candidates scoring well in this question grouped the tasks season by season, or took individual activities and related them to the appropriate time of year. Better candidates provided good descriptions of the task. For example, mulching is best carried out in spring to suppress weeds and retain moisture, use well rotted organic matter, 50-75 mm depth, avoid sensitive crowns/rootstocks, top up at intervals. Those scoring less well simply listed activities with minimal descriptions.

Part b) sought information on renovation activities of a bed, containing four named perennials. Marks were awarded for good descriptive detail of appropriate renewal/renovation practises. For example, division is best carried out spring or autumn, dig up the whole clump, reduce foliage, split with forks/knives/spade, ensure each division has a significant amount of crown/root. Marks were also awarded for alternatives to division such as basal and root cuttings for *Delphinium* and *Papaver* respectively. Credit was also given to those describing soil amelioration activities performed while plants were removed from the soil. A number of candidates wasted time by describing the ornamental features of the named plants which was not asked for.

Section D – Hardy Ornamental Nursery Stock

Q15 Evaluate the use of **EACH** of the following, in relation to the production of hardy ornamental nursery stock:

- i) mist propagation unit;
- ii) contact polythene;
- iii) micro-propagation unit;
- iv) plastic clad tunnel;
- v) cold frame.

This question asked candidates to evaluate the use of a mist propagation unit, contact polythene, micro propagation unit, a plastic clad tunnel and a cold frame. By asking for an evaluation, answers should be based upon judging the quality or value of the five specified items.

In relation to the production of hardy ornamental nursery stock, marks were distributed equally, therefore suggesting that each response should be of equal weight in answering the question. This question proved to be very popular amongst candidates and most gained high marks, although there was evidence that some were confused regarding current commercial applications. Importantly within the HONS industry, each item would depend upon the type of operation in question and that in turn depend upon financial constraints of the business, the availability of labour and the skill of that labour.

In part i) marks were awarded to those that included an accurate description of the equipment, the importance of a heated base and where the advantages of mist reduced transpiration with the possibility of automation of a mist unit. Part of the evaluation process would be to also identify disadvantages such as disease potential together with cost in setting-up and establishing the mist propagation unit.

Part ii) asked for the evaluation of contact polythene. Although many achieved good marks, there was evidence that some candidates were not familiar of the use of polythene within nursery stock. Marks were gained for identifying uses such as covering cuttings on a bench, or in a frame within a protected structure; and to covering seeds to enhance soil warming. This method is low cost, but nevertheless an effective method of aiding growth. Again disadvantages needed to be also addressed such as disease, the increase of condensation, only manual and not automated. Few candidates suggested the insertion of cuttings through the plastic membrane which gained additional marks. This process is for small scale propagation.

Part iii) related to a micro propagation unit and, in general, candidates demonstrated a sound understanding of the concept. Used to propagate plant material vegetatively, it is a specialised operation, where the plant material is derived from very small pieces of plant material maintained in an aseptic environment on a sterile substrate. The micro propagation system permits propagation of plant material that may be in short supply, allows 'bulking up' prior to distribution and with the environmental conditions means the material is free from pests and diseases. This can be an expensive method due to the set-up costs and additionally training of staff which in itself can be costly.

Part iv) asked candidates to evaluate the use of a plastic clad tunnel. Marks were awarded for descriptions of a 'walk-in' or low poly tunnel. Most candidates' responses gained high marks. These structures have plastic stretched over the framed structure which provides protection to the production of plant material from outside weather conditions. In making an evaluation, these structures are relatively cheap, of simple construction for installation and easily maintained. A wide range of plastic membrane is available that overcomes many of the

problems associated with this type of propagation, such as UV stabilizers within the membrane which reduces the degrading of the plastic, anti-fogging chemicals impregnated into the plastic membrane to prevent condensation and improved thermal properties because of being double skinned. Varying types of material can also create shade which prevents burning of the plant material. The use of such structures also allows the manipulation of environments within the tunnel which in turn 'forces' or 'holds back' the stock plants. Such structures nevertheless display disadvantages such as rapid loss of heat, especially during night time and winter periods, a limited life span of the plastic membrane, (where periodically the sheeting requires replacing) and also a degree of opacity which reduces the light efficiency for photosynthesis to take place.

Part v) asked for an evaluation of a 'cold frame' and here candidates gave good accounts gaining high marks in general. It was highlighted that cold frames, like polytunnels, have the ability to manipulate environments in the production of HONS in propagating plant material. Cold frames also provide protection from poor weather conditions and construction can be from many different materials. Good answers included that it is inexpensive, can be constructed from many materials (eg glass, plastics), is of simple construction, is easily maintained and it allows protection for a wide range of plant material. The disadvantages would include: a difficult height in which to work, required manual ventilation or shading and may require frost protection during severe winter conditions.

- Q16** a) Evaluate the physical and chemical properties of **FOUR** bulky ingredients that may be used in nursery stock compost.
- b) Identify **FOUR** hazards and the associated risks when using composts.

This question asked candidates to evaluate the physical and chemical properties of four bulky ingredients used in HONS. As in the previous question, by asking for an evaluation, answers should be based upon judging the quality or value of the four specified items.

In relation to the mark distribution of the question, clearly emphasis was on part a), therefore suggesting that much more detail in the answers was required for the first part with examination time needing to be distributed appropriately also. This question proved to be unpopular amongst candidates and most candidates gained average marks, although there was evidence that both hazards and risks were being very well identified.

In part a), most candidates were able to identify four separate bulky ingredients such as peat, coir, bark, loam, perlite or vermiculite supported by their physical properties, but there was clear evidence of a lack of knowledge regarding chemical properties. In order to gain high marks, candidates would need to provide details for each chosen bulky ingredient of: pH, nitrogen, potassium and phosphorus content, porosity, aeration capability, life expectancy in decay value against other bulky material such as peat, ability to maintain moisture/water capacity and environmental impact. Each of the chosen bulky ingredients needed such detail with supporting background information as to its appropriate use, its value to alternative bulky ingredients and its advantages to the nursery stock production as a compost.

Part b) asked for the associated risks and hazards when using compost material. Examples included physical risks to individuals from transporting heavy bags of compost material identifying back and knee injuries or alternatively, when preparing one's own compost mix, again strain on back, legs, arms and neck when using wheel barrows.

Additional responses included the need to wear protective and appropriate clothing with appropriate equipment when working with composts where dust is a key factor for irritating eyes or causing respiratory conditions from inhalation.

Bacterial contamination as harmful inclusion needed to be mentioned especially when dealing with animal manure as a compost ingredient. This could include microbes such as salmonella and therefore need hand-washing with disinfectants and the wearing of gloves to reduce the potential spread.

Other hazards included the improper use of tools and equipment, both manual and mechanical, with good identification of what is required in order to prevent such injuries.

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