RHS LEVEL 3 ADVANCED/DIPLOMA IN HORTICULTURE
WRITTEN EXAMINATION

2:00pm Wednesday 8th July 2009

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 **FOUR** benefits of aerating an area of amenity turf. **2**

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Q2 State **FOUR** reasons why top dressings are applied to fine turf areas. **2**

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Q3 Name **FOUR** grass species suitable for use in a wildflower meadow. **2**

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Q4 Name **FOUR** hardy marginal (shallow water) aquatic plants suitable for an ornamental pond. **2**

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Please see over/…..

ANSWER ALL QUESTIONS

MARKS

Q5 State the correct time and type of pruning for **EACH** of the following shrubs:

i) *Forsythia* x *intermedia*;
ii) *Buddleja davidii*;
iii) *Hydrangea macrophylla*;
iv) *Wisteria sinesis*. **2**

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Q6 State **FOUR** characteristics of good ground cover plants. **2**

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Q7 Describe what is meant by a ‘layer bed’. **2**

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ANSWER ALL QUESTIONS

MARKS

Q8 State the implications of 'Plant Breeders' rights for the production of hardy nursery stock. **2**

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Q9 Describe the recommended treatment of bare root plants after lifting and before re-planting. **2**

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Q10 State **FOUR** operations carried out in the preparation of container-grown stock for selling on. **2**

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The Royal Horticultural Society, Wisley, Woking, Surrey, GU23 6QB.

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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)	Describe the processes involved in the autumn maintenance of fine turf areas.	**12**
	b)	State the major risks when using a **NAMED** turf machine and describe how **EACH** of the risks can be minimised.	**8**
Q12	a)	Describe the soil preparations necessary to provide optimum conditions for establishing a fine lawn from turf.	**9**
	b)	Describe the characteristics of high quality turves for the establishing of a fine lawn from turf.	**6**
	c)	Describe the subsequent treatment of the lawn after laying to aid establishment.	**5**

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Please see over/…..

Section C – Plant Selection, Establishment & Maintenance

Answer ONE question only from this section

MARKS

Q13 a) List and describe **FIVE** distinct genera for spring, and **FIVE** distinct genera for summer display for a 9m diameter bed in a public garden. **10**

b) Prepare an annual work schedule for the planting and maintenance of the displays in a). **10**

Q14 a) Produce a planting plan for a mixed border 5m x 2m, to provide year round colour, using 6 plants, **EACH** from different genera. **8**

b) For **EACH** of the plants chosen, indicate the seasonal colour and interest contributed by them to the overall scheme. **6**

c) Describe the seasonal tasks necessary to maintain such a feature. **6**

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Please turn over/.....

Section D – Hardy Ornamental Nursery Stock

Answer ONE question only from this section

MARKS

Q15 For an area where bought-in liners are grown on, describe **EACH** of the following:

i) geographical location; **5**
ii) choice of site; **5**
iii) facilities and equipment required. **10**

Q16 a) Explain why dormancy presents difficulties in the growing of Hardy Ornamental Nursery Stock (HONS) from seed. **8**

b) Describe practical techniques for minimising the difficulties identified in a). **8**

c) Describe the range of seed sowing methods used for small-scale production of hardy plants. **4**

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MODULE J

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

Candidates Registered	**190**		**Total Candidates Passed**	124	78.48%
Candidates Entered	158	83.16%	Passed with Commendation	32	20.25%
Candidates Absent	16	8.42%	Passed	92	58.23%
Candidates Deferred	10	5.26%	Failed	34	21.52%
Candidates Withdrawn	6	3.16%			

Section A – Short Answer Questions

Inaccurate and mis-spelt botanical plant names were a source of lost marks.

Q1 State **FOUR** benefits of aerating an area of amenity turf.

Most candidates had an understanding of the reasons for aeration. Stating that it allowed air into the soil was repeating the essence of the question so could not be rewarded. Aeration assists and increases the flow of air, water and nutrients to the root zone. It further alleviates compaction of the soil to allow improved root penetration. The build-up of thatch is broken down through aeration allowing free movement of water, air, fertiliser and light. Other benefits are a saving of up to 50% water, the reduction of water run-off and puddling, enhances heat and drought stress tolerances and improves resiliency and cushioning.

Q2 State **FOUR** reasons why top dressings are applied to fine turf areas.

While bullet points are useful, candidates who justified their listed answers could be best rewarded as they better demonstrated their knowledge of the benefit of the operation. Applications of sand as top dressings do not alleviate drainage except when brushed into the holes left by aeration. To state that iron applications kill moss is not true, ferrous sulphate in lawn sand does that. Top dressing can be interpreted to mean a surface application of fertilizer (usually nitrogen). The application to turf can be sand, soil, organic material or a combination of these. Reasons for top dressing are that it increases water-holding capacity, fills holes left from aeration, corrects surface irregularities and aids thatch breakdown.

Q3 Name **FOUR** grass species suitable for use in a wildflower meadow.

A wide range of grass species was allowable as no particular habitat was specified. Suggested use of strongly growing grasses could not be rewarded as they would quickly outgrow the flowering plants. Mis-spelling the botanical names of grasses lost marks. Species that would be suitable are: Agrostis stolonifera, Alopecurus pratensis, Cynosurus cristatus, Festuca pratensis, Trisetum flavescens and Koeleria macrantha.

Q4 Name **FOUR** hardy marginal (shallow water) aquatic plants suitable for an ornamental pond.

Scant knowledge of shallow water marginals was demonstrated. Too often plants preferring moist soils were cited or plants not fully hardy. Candidates wasted time writing down vernacular names. Examples of acceptable plants are: Typha minima, Caltha palustris, Alisma plantago-aquatica, Juncus effusus 'Spiralis' and Iris laevigata.

Q5 State the correct time and type of pruning for **EACH** of the following shrubs:

i) *Forsythia x intermedia;*
ii) *Buddleja davidii;*
iii) *Hydrangea macrophylla;*
iv) *Wisteria sinesis.*

Forsythia x intermedia – Late spring/summer soon after flowering, 1 in 3 stems of old growth.
Buddleja davidii – Winter or early spring whlist dormant, 30cm from ground.
Hydrangea macrophylla – Spring prune back to good buds, 1 in 3 stems of old growth.
Wisteria sinesis.- Winter or early spring whilst dormant, Jan/Feb side shoots to 2/3 buds, summer after flowering to 5/6 buds.

Some candidates only addressed half the question, giving pruning times or types of pruning but not both as required. Very few candidates mentioned the need to prune back to buds. The use of the terms such as 'rejuvenative', 'formative' and 'maintenance pruning' could not be rewarded as they did not adequately demonstrate that the candidate knew what that entailed for the particular subject. Other stumbling blocks proved to be:-
F. x intermedia – Cutting back 1/3 is not the same as removing 1 in 3 stems of old growth.
B. davidii – Cutting 'hard back' to ground level could not be rewarded.
Hydrangea macrophylla – Some candidates did not appreciate that dead flower heads can protect the lower buds so are left until after the last frosts.
Wisteria sinesis – Stating that this needs 'specialist pruning' did not answer the question.

Q6 State **FOUR** characteristics of good ground cover plants.

The answers were often citing specific qualities true for any ornamental planting rather than specific to ground cover. In some cases there was an assumption that ground cover was only used in difficult areas or areas of dry shade which is patently untrue.
Characteristics:

- plants tend to be low growing (less than 60cm), but spread easily;

- ground cover plants should be dense to inhibit weeds;
- best species should produce rhizomes or stolons, or spread by off-sets or tip layering;
- must be readily reduced when necessary;
- usually evergreen;
- must not have high fecundity.

Q7 Describe what is meant by a 'layer bed'.

Layer beds are a commonly employed means of propagation in the HONS industry. A layer bed requires well-spaced mother plants and improved fertile soil or rooting medium. There was some confusion with stool bed production. This was often a mis-read question many candidates describing the process of layering rather than a 'layer bed'.

Q8 State the implications of 'Plant Breeders' rights for the production of hardy nursery stock.

Few candidates appeared to appreciate that the question was addressing the 'implications' to HONS industry. While the questions of 'patents', 'royalties' and financial returns to the breeder were addressed, fewer candidates picked up on the increased cost of production for the grower, the limiting effects on the spread of new cultivars (due to restricted distribution) and the higher cost to the consumer.

Q9 Describe the recommended treatment of bare root plants after lifting and before re-planting.

Common errors included failing to appreciate this was about bare-root stock which would therefore be dormant (deciduous and not in leaf). The difference in root balled and bare rootstock was not fully understood by some candidates. The lack of practical knowledge of the HONS industry was apparent. The root system of bare-root plants must not be allowed to dry out so any protective treatment, eg. wrapping in damp material, was acceptable. The time between lifting and re-planting must also be kept to a minimum. If they are to be transported any distance they may need preventative fungicidal treatment.

Q10 State **FOUR** operations carried out in the preparation of container-grown stock for selling on.

Most candidates appreciated the operations involved in both the stages of production and in the final preparations for sale. Listing routine maintenance such as irrigation could not be rewarded. Suggested operations could include grading, checking specification, removing damaged material, tying in to a support, cleaning the surface of the compost and labelling, although any other appropriate operation would have been acceptable.

Sections B, C & D – Structured Questions

Section B – Establishment & Maintenance of Decorative Ornamental Turf

Q11 a) Describe the processes involved in the autumn maintenance of fine turf areas.

b) State the major risks when using a **NAMED** turf machine and describe how **EACH** of the risks can be minimised.

Generally the first part of the question was answered quite well with the main autumn operations covered thoroughly. However there was a need in a few cases to adopt a more organised approach to setting out the answer e.g. in a reasonable sequence. Good marks were obtained when each operation was described fully in terms of timing, severity, frequency and with what equipment and/or materials. Also included were less major operations such as leaf clearance.
It is not sufficient to merely list the tasks.
There was a little confusion over the use of metric scales e.g. lbs/sq.m or kg/sq.yd. Care needs to be taken over simple heights of cut e.g. 0.5**m** is rather long for fine turf.
The second part of the question was less well answered. There were a few candidates confused about the question, assuming risks to the turf rather than to people while others listed several machines. However those who received higher marks listed the risks and by the side of each how it could be minimised.

Q12 a) Describe the soil preparations necessary to provide optimum conditions for establishing a fine lawn from turf.

b) Describe the characteristics of high quality turves for the establishing of a fine lawn from turf.

c) Describe the subsequent treatment of the lawn after laying to aid establishment.

The first part of this question was well and thoroughly answered in most cases. Where there were some weaknesses it was in the description of each operation. On the whole consideration was given to the site in terms of drainage, slopes, soil type and condition all of which lead on to the tasks necessary to establish a fine lawn.

The answers to part (b) of this question were generally disappointing – not concentrating on the question. The answers involved the grass content for fine turf, freedom from weeds pests and diseases, the condition of the grass in terms of colour and density. It also involved the uniform size and thickness of the turves and their moisture content and root growth. Top marks were obtained for those who concentrated on these.
Many answers concentrated on descriptions of the grasses in the turf.

Part (c) was answered well although there was a tendency to go well beyond establishment into routine maintenance. Treatment would include:

- Watering in dry conditions.
- Application of a sandy top dressing and luted or brushed into turf joins.
- Avoidance of walking on newly laid turves 3 – 4 weeks.
- Cut first at 18mm.

Section C – Plant Selection, Establishment & Maintenance

Q13 a) List and describe **FIVE** distinct genera for spring, and **FIVE** distinct genera for summer display for a 9m diameter bed in a public garden.

b) Prepare an annual work schedule for the planting and maintenance of the displays in a).

The aim of this question was to test candidates knowledge of successional bedding.
To score well in the first part, candidates needed to provide detailed descriptions of each genus selected. This could have included height/spread, use in the display i.e. edging, dot, colours available, any other relevant cultural detail i.e. a perennial but treated as an annual/biennial.

For the second part, candidates needed to produce an annual work schedule for the display bed. The two important times in the year are September/October & May/June. These two points in the calendar gave candidates the opportunity to discuss the clearing of the old display, ground preparation, replanting with new display.

There were many good responses to this question. Candidates who scored weakly in section a) provided only limited descriptions eg. Tagetes - yellow flowers. A minority of candidates also selected and described inappropriate genera for successional display, such as woody perennials, which are better permanently located and not subject to “annual” planting. The better candidates for part b), not only discussed the activities relating to the two change-over periods, but also included other cultural activities such as dead-heading, weeding, watering, feeding, edging, pest/disease control.

Q14 a) Produce a planting plan for a mixed border 5m x 2m, to provide year round colour, using 6 plants, **EACH** from different genera.

b) For **EACH** of the plants chosen, indicate the seasonal colour and interest contributed by them to the overall scheme.

c) Describe the seasonal tasks necessary to maintain such a feature.

The aim of this question was to test candidates’ knowledge of the selection and care of a broad range of ornamental plants.
For part a), candidates were required to produce a plan/diagram which showed the location/spacing/use of height relating to the 6 selected genera.

The second section required detailed descriptions of the ornamental qualities of the plants selected. The better attempts related examples of such things as flower and fruit display to the appropriate season in order to demonstrate year round colour. Relevant seasonal tasks to maintain the 6 selected groups included pruning, division, pest/disease control, weeding, feeding, staking, watering, mulching.
There were many good examples of mixed borders showing year round colour. However there were a number of common themes from those

candidates who scored less well; poor diagrams, minimal indication of spacing/nos, failure to select a mixed border ie. all herbaceous genera selected.

Section D – Hardy Ornamental Nursery Stock

Q15 For an area where bought-in liners are grown on, describe **EACH** of the following:

i) geographical location;
ii) choice of site;
iii) facilities and equipment required.

The question aims to test students' knowledge on

- site selection for a nursery stock area;
- logistics of operating a business growing on nursery stock;
- specific facilities this type of nursery business would require.

The question specified 'bought-in liners' to indicate that container stock was being grown on; many answers related exclusively to the soil and site requirements and facilities for open ground tree nurseries, with emphasis on undercutting and transplanting of trees.

(i) and (ii) Highest marks went to candidates who considered geographical position and site in the context of transport infrastructure - road, rail and port access for incoming and outgoing stock – and in terms of workforce, local outlets and planning constraints. Soil quality and pH were not relevant for container stock, though drainage was, as irrigation would be important and runoff would be an issue. A good answer would include the aspect of the site, a slight slope for drainage (a level site was acceptable if the answer mentioned the benefit for setting out container stock) with shelter from high winds but not too much shade, water and power on site, and with good access for large lorries delivering the liners.

(iii) Answers which concentrated exclusively on the facilities and equipment needed at an open-ground tree nursery could not be awarded many marks, nor those which listed nursery propagation facilities, the question stated that liners were bought in and grown on for resale.
However most candidates answered this section well, with sensible lists of:

- Growing facilities (polytunnels or glass, shade tunnels, container beds, wind shelters and irrigation, standing down areas for pots).
- Support facilities (transport around and offsite, tools, storage for these; secure storage for chemicals and equipment for application; administration building/reception with computers etc for stock control; staff restroom, lavatories, etc;).
- Production facilities (potting machines and benches, area for dry storage of compost, machines for mixing, area for waste disposal, covered working areas or sheds, labelling equipment and packing and dispatch areas).

Some candidates produced excellent answers with labelled diagrams to show an efficient layout of the site.

RECOMMENDATIONS
On the whole this question was answered very well, but candidates should read the question carefully and try to keep to it, otherwise they can waste valuable exam time on material which cannot be awarded marks.

Q16 a) Explain why dormancy presents difficulties in the growing of Hardy Ornamental Nursery Stock (HONS) from seed.

b) Describe practical techniques for minimising the difficulties identified in a).

c) Describe the range of seed sowing methods used for small-scale production of hardy plants.

The question aims to test students' knowledge on seed dormancies and methods of overcoming these in a nursery context – commercial methods where these apply.

a) This part of the question aimed to produce answers explaining the different types of dormancy that occur to prevent seeds from germinating when the temperature is right and they have adequate supplies of water and oxygen. Highest marks were awarded where candidates covered immature embryos, after-ripening, inhibitors in fruits and in seed coats, hard or waxy seedcoats and double dormancies. Candidates who looked at this from the perspective of the nursery manager, and added points relating to the practical problems that irregular germination caused to a business (extra costs, unpredictable timing for material required in batches , less efficient working methods, more highly-trained staff to deal with individual seed requirements) were also awarded marks.

b) This part of the question expected candidates to describe methods of avoiding dormancy in seeds (picking 'green') and of overcoming other dormancies. Relevant examples were needed here as these are very plant-specific, and practical methods in a nursery context were awarded highest marks. Stratification in a sand bed or stratification pit was a good answer for some dormancies, as was late-summer sowing for immature embryo ripening, but answers needed to include practical points about vermin control and the use of herbicides to control weeds over a long period.

c) This question related to seed sowing methods for small scale production, so answers which gave details of machine seeders were not relevant. Broadcast or drill sowing in a small seedbed was acceptable, as was sowing in pots or containers and sowing fine seed with sand. However full marks required some reference to covering pots or trays with grit, overwintering in coldframes or outdoors to overcome dormancy, and protecting seeds from vermin.

RECOMMENDATIONS
This question was not answered fully by many of the candidates who attempted it. It is important when reading questions to relate the number of marks to the information you are being asked for; named plant examples may make a great difference to marks.
In part c) relating this to the rest of the question about dormancy would have given candidates clues about the information that was required.