



R2102

PLANT NUTRITION AND THE ROOT ENVIRONMENT

Level 2

Monday 27 June 2011

13.30 – 14.10

Written Examination

Candidate Number:

Candidate Name:

Centre Number/Name:

IMPORTANT – Please read carefully before commencing:

- i) The duration of this paper is **40 minutes**;
- ii) **ALL** questions should be attempted;
- iii) **EACH** question carries **10 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.

Answer all questions

Marks

1. Describe **ONE** positive and **ONE** negative environmental impact of the horticultural practices listed below:

- | | | |
|------|-------------------------------|---|
| i) | traditional cultivation; | 2 |
| ii) | no dig cultivation; | 2 |
| iii) | garden irrigation; | 2 |
| iv) | soil drainage systems; | 2 |
| v) | use of coir in growing media. | 2 |

Total Mark

Please see over

2. a) State what is meant by the following terms:

- i) 'primary cultivation';
- ii) 'secondary cultivation'.

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b) Complete the table below by:

- i) stating the season when **EACH** technique is carried out;
- ii) describing **ONE** negative effect of carrying out **EACH** technique at the wrong time of year.

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Technique	Season	Negative effect
Primary cultivation		
Secondary cultivation		

Total Mark

Please turn over

3. a) State what is meant by the term 'soil texture'. 1

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- b) Describe **THREE** characteristics of **EACH** of the soil types named by completing the table below: 9

Soil particle	Soil characteristics
Sand	
Silt	
Clay	

Total Mark

Please see over

4. a) State when bulky organic mulch should be applied to an area planted with shrubs. 1

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- b) Name **ONE** cultural operation required prior to applying the mulch. 1

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- c) List **FOUR** bulky organic materials that can be used as mulch for planted areas of a garden. 2

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- d) For **TWO** of the mulch materials listed in c), state a suitable garden situation where they could be used and give **ONE** benefit and **ONE** limitation of **EACH**. 6

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Total Mark

Please turn over

5. a) State what is meant by the following terms, and give **ONE** example of a situation where **EACH** would be used:

- i) 'base dressing'; 2
 ii) 'top dressing'; 2
 iii) 'liquid feed'. 2

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- b) Describe **ONE** visual plant deficiency symptom for **EACH** of the plant nutrients by completing the table below: 3

Nutrient	Deficiency symptom
Nitrogen	
Magnesium	
Iron	

- c) State the pH required for optimum soil nutrient availability for plant growth. 1

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Total Mark

Please see over.....

6. a) Describe the relationship between pore size, air and water availability by completing the table below:

6

Pore size	Air availability	Water availability
Macro		
Meso		
Micro		

- b) Describe **FOUR** surface symptoms which are characteristic of poorly drained soils.

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Total Mark

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R2102

PLANT NUTRITION AND THE ROOT ENVIRONMENT

Level 2

Monday 27 June 2011

Candidates Registered	803	Pass with Commendation	111 (16.79%)
Candidates Entered	661 (82.3%)	Pass	332 (50.23%)
Absent/Withdrawn/Deferred	142 (17.7%)	Fail	218 (32.98%)
Total Candidates Passed	443 (67.02%)		

Senior Examiner's Comments:

1. Candidates should be able to demonstrate a good range of plant knowledge and be able to give accurately named plant examples where appropriate. Common names and generic names are often too vague and cannot be rewarded in the positive manner that genus, species and where appropriate, variety/cultivar can. This is particularly important when answering questions relating to particular (named) plant(s). Marks can only be awarded for these narratives where the example(s) are correctly and fully identified.
2. Candidates must be able to display accurate knowledge of the technical terms and concepts detailed in the syllabus, in the context of horticulture and be aware that wider interpretation will not be rewarded. The examination should be regarded as a possible introduction to higher level studies, which will only be open to those who are in possession of a clear understanding of the horticultural terms and concepts which are current.
3. The introductory rubric given on the first page of each question paper should be read carefully by candidates. At each examination there are a significant number of candidates who ignore or misread the instructions given and consequently may not perform as well as they could have done.
4. Candidates should pace themselves during each paper. The most successful candidates allow sufficient time to read the question thoroughly before answering it and also take time to read through their answers. They should take care to write as legibly as possible, so that the examiner is in no doubt about what is intended.
5. Candidates need to interpret key words within questions, particularly those such as 'state', 'list' and 'describe'. Questions requiring descriptions or explanations obviously require a more detailed answer than those requiring a list.

6. It is important to ensure that responses to questions are to the point. Candidates should bear in mind that small sketches might be used to convey information more succinctly than words.
7. Successful candidates ensure that their answers are focused and to the point. It is disappointing when they cannot be rewarded for their efforts because the answer is irrelevant to the particular question. Candidates should take note of the mark allocation for specific sections and allocate their time and efforts accordingly.
8. Diagrams can enhance an answer and where appropriate can replace detailed descriptions. They should be large, clear and well annotated, and preferably in pencil. Colour may be used successfully but only where it is relevant to the answer.
9. In each examination it is clear that some candidates are ill prepared to answer papers of the type set. It is essential that candidates have the opportunity to practice questions. Ideally some papers should be answered in a time constrained situation.
10. Candidates should be aware of the reading list of suggested books for the RHS Level 2 Certificate in The Principles of Plant Growth, Propagation and Development which is available from the Qualifications Section and can also be found on the RHS website together with past papers.

Examiners' Comments:

	Marks
1. Describe ONE positive and ONE negative environmental impact of the horticultural practices listed below:	
i) traditional cultivation;	2
ii) no dig cultivation;	2
iii) garden irrigation;	2
iv) soil drainage systems;	2
v) use of coir in growing media.	2

The best answers showed a clear understanding of the term or practice and gave good examples of positive and negative environmental impacts which were awarded high marks. Some candidates described the environmental impacts without first clearly defining the term or practice.

- i) Positive examples included increased aeration and drainage which encourages aerobic respiration in plant roots and soil organisms, leading to healthy plant growth and root environment.
Negative examples included compaction and drainage problems leading to anaerobic conditions which may lead to denitrification.
- ii) Positive examples included the development of a natural soil structure leading to increased soil water retention and build-up of organic matter.
Negative examples included the formation of pans due to the movement of clay down the soil profile which may cause waterlogging and the development of anaerobic conditions.

- iii) Positive examples included the use of garden irrigation to ensure that plants are not stressed and are less likely to require chemical treatment for diseases.
Negative examples included the high use of water resources results in a large proportion of it evaporating without benefiting the plants.
- iv) Positive examples included soil drainage systems extending the growing season which results in increased carbon dioxide uptake and oxygen production.
Negative examples included the destruction of wetland habitats leading to a loss of biodiversity.
- v) Positive examples included coir providing a sustainable source of organic matter and reducing peat extraction.
Negative examples included the need to transport coir from the source of production leading to high carbon dioxide emissions.

2. a) State what is meant by the following terms:

- i) 'primary cultivation';
- ii) 'secondary cultivation'.

2
2

b) Complete the table below by:

- i) stating the season when **EACH** technique is carried out;
- ii) describing **ONE** negative effect of carrying out **EACH** technique at the wrong time of year.

2
4

Technique	Season	Negative effect
Primary cultivation		
Secondary cultivation		

- a)i) Those candidates who were able to include key words e.g. initial, invert, single or double digging or rough rotavating were awarded full marks.
- a)ii) The best answers stated that secondary cultivation is the preparation of the soil for planting or sowing and that the soil is not inverted. It is a type of surface cultivation where an even/uniform tilth is required.

- b) Most candidates were able to specify the correct season when each technique is carried out i.e. late autumn/winter or early spring for primary cultivation and spring or summer or autumn or during the growing season for secondary cultivation.

Negative effects for primary cultivation included loss of soil moisture and collapse of surface tilth resulting in the formation of a 'cap' for secondary cultivation. It was important for candidates to relate the negative effect to the soil for full marks.

3. a) State what is meant by the term 'soil texture'. 1
- b) Describe **THREE** characteristics of **EACH** of the soil types named by completing the table below: 9

Soil particle	Soil characteristics
Sand	
Silt	
Clay	

- a) The majority of candidates knew that soil texture is the relative proportions of sand, silt and clay particles in a given soil and were awarded the mark.
- b) Most candidates were able to describe the characteristics of different soil types e.g. free-draining for sand, unstable structure for silt and poor drainage for clay although characteristics for silt were least well understood.
4. a) State when bulky organic mulch should be applied to an area planted with shrubs. 1
- b) Name **ONE** cultural operation required prior to applying the mulch. 1
- c) List **FOUR** bulky organic materials that can be used as mulch for planted areas of a garden. 2
- d) For **TWO** of the mulch materials listed in c), state a suitable garden situation where they could be used and give **ONE** benefit and **ONE** limitation of **EACH**. 6

- a) The majority of candidates correctly stated that the time of year for applying bulky organic mulch was late winter/early spring.
- b) Candidates named a range of cultural operations including; application of water if dry, removal of weeds and forking to remove compaction which are required before applying bulky organic mulch.
- c) Most candidates were able to list four bulky organic materials e.g. well rotted garden compost, well-rotted farmyard manure leaf mould etc. Those that included the prefix well rotted and composted gained full marks.
- d) Candidates who linked the benefits and limitations to the mulch material and an appropriate garden situation were awarded full marks e.g. the use of well-rotted farmyard manure around bush roses in a mixed border maintains an open structure which allows aerobic conditions but may contain weed seeds and pathogens.
5. a) State what is meant by the following terms, and give **ONE** example of a situation where **EACH** would be used:
- i) 'base dressing'; 2
- ii) 'top dressing'; 2
- iii) 'liquid feed'. 2
- b) Describe **ONE** visual plant deficiency symptom for **EACH** of the plant nutrients by completing the table below: 3
- | Nutrient | Deficiency symptom |
|------------------|---------------------------|
| Nitrogen | |
| Magnesium | |
| Iron | |
- c) State the pH required for optimum soil nutrient availability for plant growth. 1

- a) Candidates who answered the question fully were able to state the meaning of the terms and gave a suitable situation where each would be used.
- ai) The best answers stated that a base dressing is incorporated into the soil prior to sowing or planting e.g. in a seed bed being prepared for a lawn.
- aii) Candidates who stated that a top dressing is applied to the soil surface after sowing or planting e.g. a nitrogen fertiliser broadcast on a lawn gained full marks.
- aiii) To gain full marks it was important for candidates to state that a liquid feed is mixed with water and applied to the root zone e.g. on tomatoes.
- b) Most candidates were able to describe a plant deficiency symptom for nitrogen e.g. leaves turning pale green (lower leaves first) but many confused the deficiency symptoms for magnesium (interveinal chlorosis on older leaves) with deficiency symptoms for iron (interveinal chlorosis on younger leaves) for which marks could not be awarded.
- c) Candidates who understood the question clearly gave an acceptable pH i.e. 6.5 – 7.0 and gained full marks. Many candidates confused this with the pH range over which plants grow.

6. a) *Describe the relationship between pore size, air and water availability by completing the table below:*

6

<i>Pore size</i>	<i>Air availability</i>	<i>Water availability</i>
<i>Macro</i>		
<i>Meso</i>		
<i>Micro</i>		

- b) *Describe **FOUR** surface symptoms which are characteristic of poorly drained soils.*

4

- a) The best answers were from candidates who understood the relationship between pore size, air and water availability. Examples included macro pores having good air availability due to rapid drainage and limited water availability due to the large pore size.

The availability of air in the meso pores is variable and dependent on the water present while water availability is good as optimum numbers of pores are filled with water at field capacity.

The micro pores have very limited air availability as they are filled with water and although water is present it is unavailable.

- b) The majority of candidates were able to describe four surface symptoms of poorly drained soils and gained full marks. Examples included; water puddles on the surface, presence of indicator plants like *Ranunculus repens*, stunted plant growth and chlorosis of plants due to nitrogen leaching.

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