



R2102

PLANT NUTRITION AND THE ROOT ENVIRONMENT

Level 2

Monday 13 February 2012

11.00 - 11.40

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.
- vii) Please note, sufficient lined space is provided. It is not necessary that all lined space is used when answering a question.

ANSWER ALL QUESTIONS

MARKS

Q1 Describe **ONE** benefit to plant growth of **EACH** of the following soil constituents by completing the table below.

Soil Constituents	Benefit to plant growth	
Soil organic matter		2
Soil organisms		2
Soil air		2
Soil water		2
Soil mineral nutrients		2
		Total Mark

Please see over/.....

Q2 a) Explain what is meant by the term 'soil structure'.

3

b) Name the ideal soil structure for horticultural use.

1

c) Describe **TWO** horticultural practices which damage soil structure.

6

Total Mark

Q3 a) State the symptoms and causes of 'lime induced chlorosis'.

3

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b) Identify **TWO** materials that can be used in a garden soil to:

- i) raise the pH;
- ii) lower the pH.

2

2

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c) State the importance of having knowledge of soil pH when selecting plants.

3

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Total Mark

Please see over/.....

Q4 a) Identify **FOUR** distinct methods of composting garden waste.

2

b) Describe **ONE** of the composting methods named in a), under **EACH** of the following headings:

- i) site;
- ii) selection of material;
- iii) ratio of 'green to brown' material;
- iv) management during compost formation.

2

2

2

2

Total Mark

Please turn over/.....

Q5 a) State what is meant by the term controlled release fertilizer (CRF).

1

b) Name **TWO** horticultural situations when CRFs can be used.

1

c) Describe **TWO** benefits and **TWO** limitations of using CRFs.

8

Total Mark

- Q6** a) State **TWO** benefits of using growing media in containers compared to garden soil.

2

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- b) State **ONE** distinct characteristic of **EACH** of the compost types listed by completing the table below.

8

Compost Type	Characteristic
Peat based	
Loam based	
Peat Free	
Multipurpose	
Ericaceous	
Seed	
Cutting	
Container	

Total Mark

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Level 2

Monday 13 February 2012

Candidates Registered	1117	Pass with Commendation	91 (9.66%)
Candidates Entered	942	Pass	439 (46.6%)
Absent/Withdrawn/Deferred	175	Fail	412 (43.74%)
Total Candidates Passed	530 (56.26%)		

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:

- Q1** Describe **ONE** benefit to plant growth of **EACH** of the following soil constituents by completing the table below. **Marks**

Soil Constituents	Benefit to plant growth	
<i>Soil organic matter</i>		2
<i>Soil organisms</i>		2
<i>Soil air</i>		2
<i>Soil water</i>		2
<i>Soil mineral nutrients</i>		2

Candidates who were able to describe fully a benefit to plant growth of the soil constituents gained full marks. These include;

Soil organic matter improves water retention within the soil which helps to prevent water stress in the plant during dry periods.

Soil organisms assist in the breakdown of organic matter in the soil which releases plant nutrients for the roots to take up.

Soil air provides aerobic conditions in the soil which supports root respiration leading to root growth and development.

Soil water maintains plant turgidity, is essential for photosynthesis and the uptake of nutrients by the plant.

Soil mineral nutrients e.g. phosphate is essential for respiration and sugar phosphate production.

- Q2**
- a) *Explain what is meant by the term 'soil structure'.* **3**
 - b) *Name the ideal soil structure for horticultural use.* **1**
 - c) *Describe **TWO** horticultural practices which damage soil structure.* **6**
- a) Most candidates were able to explain that soil structure is the combining together of the soil particles sand, silt and clay with the soil organic matter to form aggregates/peds which form an intricate network of cracks, pores and channels within the soil.
- b) Most candidates named the ideal soil structure for horticultural use as one that is friable with a good crumb structure and were awarded the mark.
- c) Candidates provided a range of practices which included; regularly rotavating the soil at the same depth which can cause smearing and cause a soil pan to form, digging in wet weather which can cause smearing and compaction and overwatering which can cause soil capping and poor root penetration. Detailed answers were awarded maximum marks.
- Q3**
- a) *State the symptoms and causes of 'lime induced chlorosis'.* **3**
 - b) *Identify **TWO** materials that can be used in a garden soil to:*
 - i) *raise the pH;* **2**
 - ii) *lower the pH.* **2**
 - c) *State the importance of having knowledge of soil pH when selecting plants.* **3**
- a) The majority of candidates understood that lime-induced chlorosis is due to iron deficiency and that plant symptoms can include leaves developing interveinal chlorosis which may lead to pale or bright yellow leaves on new growth.
- b) Most candidates provided a range of materials and included; calcium carbonate, limestone, wood ash, composted green waste and spent mushroom compost for raising the pH in a garden soil. Materials for lowering the pH of a soil included; sulphur, composted pine needles, bracken and farm yard manure. A few candidates identified the materials the wrong way round and could not be awarded any marks.
- c) The best candidates linked the correct pH and maintenance of the correct conditions to avoid deficiency symptoms on plants.

Examples of calcifuges (acid loving plants) e.g. *Rhododendron ponticum* and calcicoles (lime tolerant plants) e.g. *Fagus sylvatica* were correctly named.

Q4 a) Identify **FOUR** distinct methods of composting garden waste. **2**

b) Describe **ONE** of the composting methods named in a), under **EACH** of the following headings:

i) site; **2**

ii) selection of material; **2**

iii) ratio of 'green to brown' material; **2**

iv) management during compost formation. **2**

a) The majority of candidates were able to name four methods of composting garden waste and included; traditional heap, trench, leaf, compost bins, rotary composters and the use of black bags and gained full marks. A few candidates named the materials used in composting and not the methods and could not be awarded any marks.

b) Candidates who had identified suitable composting methods were able to gain marks in this section of the question.

i) Composters must be sited on soil to allow drainage, sheltered from strong winds and intense sun and accessible to be able to move the bulky material.

ii) Materials suitable for composting include leafy, herbaceous, soft woody and hedge cuttings whereas perennial weeds, weed seeds, cooked food etc are not suitable.

iii) Most candidates stated a ratio of 30:1 C:N and the importance of adding the material in layers to ensure even distribution.

iv) Candidates described turning the heap to aerate it to ensure that there was enough oxygen present for micro-organism activity, covering the composter to keep it warm and assist with combustion and watering the contents of the composter if it becomes too dry to maintain the moisture content.

Q5 a) State what is meant by the term controlled release fertilizer (CRF). **1**

b) Name **TWO** horticultural situations when CRFs can be used. **1**

c) Describe **TWO** benefits and **TWO** limitations of using CRFs. **8**

a) Full marks were awarded to those candidates who stated that a controlled release fertiliser is one with a resin coat that releases the fertiliser over a set period of time to ensure a regular supply of nutrients over several months.

- b) Candidates named a range of suitable situations which included; potting on, containers for display, hanging baskets, houseplants etc and gained the mark.
- c) The best candidates were able to provide suitable benefits and limitations of using controlled release fertilisers (CRFs). Fertiliser is released over a period of time reducing the need for regular feeding, the rate of release is controlled by temperature and there is a reduction in leaching are all benefits. Limitations include; CRFs cannot supply nutrients quickly enough, expensive to buy and if incorporated in stored growing media the nutrients can reach harmful levels.

- Q6** a) State **TWO** benefits of using growing media in containers compared to garden soil. **2**
- b) State **ONE** distinct characteristic of **EACH** of the compost types listed by completing the table below. **8**

Compost Type	Characteristic
<i>Peat based</i>	
<i>Loam based</i>	
<i>Peat Free</i>	
<i>Multipurpose</i>	
<i>Ericaceous</i>	
<i>Seed</i>	
<i>Cutting</i>	
<i>Container</i>	

- a) The majority of candidates correctly stated suitable benefits including; the absence of weed seeds, sterile, absence of soil pathogens, lighter to handle and can be made for specific purposes and gained maximum marks.
- b) Candidates who gave distinct characteristics for each type of compost were awarded full marks. Peat based can be difficult to re-wet, loam based is relatively heavy, peat free water management can be difficult, multi-purpose is variable due to the source of the main ingredients, ericaceous has a suitable pH for calcifuge plants, seed has very low or no nutrients, cutting has an open structure and container compost has good drainage.

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