



R2102

PLANT NUTRITION AND THE ROOT ENVIRONMENT

Level 2

Monday 14 February 2011

13.30 – 14.00

Written Examination

Candidate Number:

Candidate Name:

Centre Number/Name:

IMPORTANT – Please read carefully before commencing:

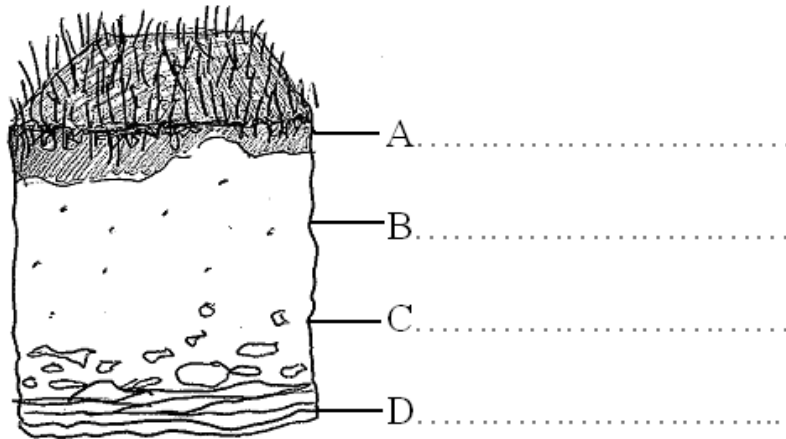
- i) The duration of this paper is **30 minutes**;
- ii) **ALL** questions should be attempted;
- iii) **EACH** question carries **10 marks**;
- iv) Write your answers legibly in the spaces provided;
- v) Use metric measurements only;
- vi) Where plant names are required, they should include genus, species and where appropriate, cultivar.

Answer all questions

Marks

1. a) Name the **FOUR** horizons labelled **A – D** in the diagram. **4**

Soil profile



- b) Describe the characteristics of the horizons **B** and **C** under the following headings:

- | | |
|--------------------|----------|
| i) organic matter; | 2 |
| ii) organisms; | 2 |
| iii) pore space. | 2 |

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Please see over

2. a) Explain the importance of an appropriate balance between air and water in soil for healthy plant growth. 3

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- b) Identify **THREE** soil surface symptoms that indicate poor drainage. 3

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- c) State what is meant by **EACH** of the following terms:

- i) 'surface capping'; 2
- ii) 'cultivation pans'. 2

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Please turn over

3. a) Describe what is meant by the term 'green manure' and name **TWO** plant species that can be grown for this purpose.

4

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- b) State **TWO** benefits and **TWO** limitations of using green manure.

4

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- c) State **TWO** alternative sources of organic matter in soil.

2

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Please see over

4. a) Describe the pH scale and state the pH range that normally supports healthy plant growth.

3

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- b) Explain how the application of sulphur affects the pH of the soil and name **TWO** plants that would benefit from this.

3

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- c) List **FOUR** major nutrients and **FOUR** minor (trace) nutrients.

4

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Please turn over

5. a) Describe the environmental implications of using the following materials in growing media: peat, coir and municipal green waste.

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- b) State **TWO** differences between peat-based and coir-based growing media.

4

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Please see over.....

6. a) State what is meant by:

i) organic fertiliser;

1

ii) inorganic fertiliser.

1

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b) Complete the table below:

8

	Organic fertiliser	Inorganic fertiliser
One benefit		
One limitation		
One named product		
Straight or compound		

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**The Royal Horticultural Society, Wisley, Woking, Surrey GU23 6QB
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Monday 14 February 2011

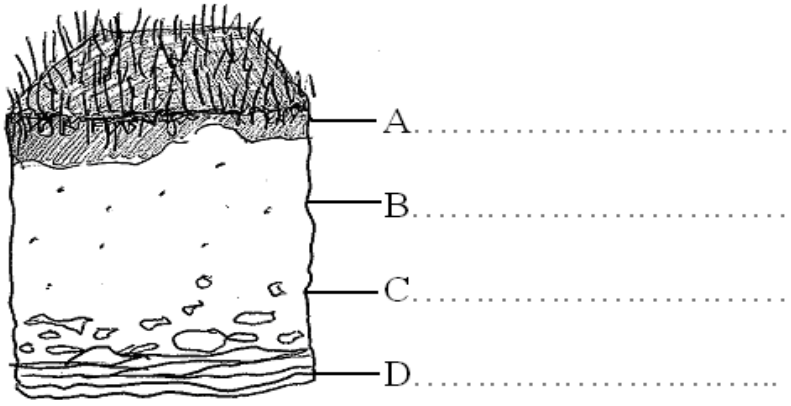
Candidates Registered	658	Pass with Commendation	197 (36.21%)
Candidates Entered	544	Pass	240 (44.12%)
Absent/Withdrawn/Deferred	114	Fail	107 (19.67%)
Total Candidates Passed	437 (80.33%)		

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. a) Name the FOUR horizons labelled A – D in the diagram. | 4 |
| <u>Soil profile</u> | |
|  | |
| b) Describe the characteristics of the horizons B and C under the following headings: | |
| i) organic matter; | 2 |
| ii) organisms; | 2 |
| iii) pore space. | 2 |

- a) The majority of candidates were able to name all four horizons; organic, topsoil, subsoil and parent rock although some candidates were confused with horizons A and D.
- b) Some candidates presented good answers by describing the characteristics in a logical manner under the three headings given. It was necessary for candidates to provide descriptions for each horizon rather than saying that horizon C had less of e.g. organic matter than horizon B. It was important that candidates were able to distinguish between soil texture and soil structure and that they were able to link pore space to soil texture.
2. a) *Explain the importance of an appropriate balance between air and water in soil for healthy plant growth.* 3
- b) *Identify **THREE** soil surface symptoms that indicate poor drainage.* 3
- c) *State what is meant by **EACH** of the following terms:*
- i) *'surface capping';* 2
- ii) *'cultivation pans'.* 2
- a) Most candidates were able to explain the relationship between air and respiration and water and nutrient uptake and made the link between the balance of air and water for healthy plant growth i.e. excess air/reduced water will cause plants to wilt, restrict root development and cause a decrease in the availability of plant nutrients etc.
- b) The best answers identified soil surface symptoms like surface capping, indicator plants, surface capping smell rather than those present in the soil profile.
- c) Candidates who answered the question fully were able to distinguish between soil capping which occurs on the surface of a soil with a weak structure which restricts water penetration and cultivation pan which is found in the soil profile and restricts drainage. Stating the effect of each on the soil gained the highest marks.
3. a) *Describe what is meant by the term 'green manure' and name **TWO** plant species that can be grown for this purpose.* 4
- b) *State **TWO** benefits and **TWO** limitations of using green manure.* 4
- c) *State **TWO** alternative sources of organic matter in soil.* 2
- a) The best definitions of green manure included the terms; incorporated, soil organic matter content, soil structure and fertility. A wide range of species that can be grown as a green manure e.g. Clover, Tares, Mustard, Phacelia were provided.

- b) Most candidates were able to provide suitable benefits and limitations of green manures which included; 'improves soil structure' and 'suppresses weeds' as benefits and 'can become a weed if allowed to seed' and 'occupies the ground for several months' as limitations.
- c) The use of the term well rotted organic matter and well rotted garden compost was essential for full marks rather than organic matter and garden compost.
4. a) *Describe the pH scale and state the pH range that normally supports healthy plant growth.* 3
- b) *Explain how the application of sulphur affects the pH of the soil and name **TWO** plants that would benefit from this.* 3
- c) *List **FOUR** major nutrients and **FOUR** minor (trace) nutrients.* 4
- a) The pH scale was well understood by most candidates as a scale that measures the acidity or alkalinity of a solution etc. but many candidates read the word ideal in the question for range which is quite different. The pH range that supports healthy plant growth is 4 – 8.
- b) Most candidates understood that the effect of adding sulphur to a soil is a lowering of the soil pH but only a few candidates explained that sulphur is converted to sulphuric acid in the soil solution. A wide range of acid loving species were acceptable and included Rhododendron ponticum, Pieris japonica and Camellia x williamsii.
- c) The majority of candidates were able to list both major and minor plant nutrients although a few candidates became confused and mixed them up.
5. a) *Describe the environmental implications of using the following materials in growing media: peat, coir and municipal green waste.* 6
- b) *State **TWO** differences between peat-based and coir-based growing media.* 4
- a) Environmental implications of using peat, coir and municipal green waste were well described by most candidates and included transport, extraction, destruction of natural habitats, carbon emissions and recycling. Discussing the suitability of the raw material for growing media was not required.
- b) This part of the question required specific information on the differences between peat and coir e.g. water management,

nutrient status and structural differences rather than referring to environmental implications.

6. a) State what is meant by:

- i) organic fertiliser; 1
- ii) inorganic fertiliser. 1

b) Complete the table below: 8

	Organic fertiliser	Inorganic fertiliser
One benefit		
One limitation		
One named product		
Straight or compound		

- a) Definitions needed to be specific showing that organic fertilisers provide plant nutrients from materials that were once living while inorganic ones are manufactured or originate from minerals.
- b) The benefits and limitations of organic and inorganic fertilisers were fully described by the better candidates stating that organic fertilisers contain additional nutrients which are released over a long period rather than having an accurate analysis and predictable rate of reaction as with inorganic fertilisers.
- c) Suitable products like Fish, Blood and Bone which is a compound organic fertiliser and Growmore which is a compound inorganic fertiliser were rewarded.

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May 2011