



R2102

PLANT NUTRITION & THE ROOT ENVIRONMENT

Level 2

Monday 5 February 2018

11:20 – 12:10

Written Examination

Candidate Number:

Candidate Name:

Centre Number/Name:

IMPORTANT – Please read carefully before commencing:

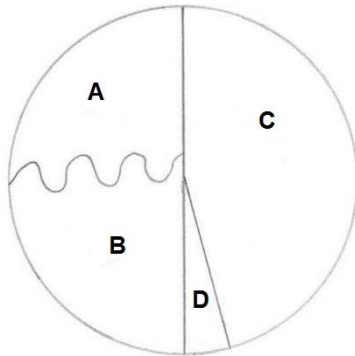
- i) The duration of this paper is **50** minutes;
- ii) **ALL** questions should be attempted;
- iii) **EACH** question carries **10 marks**;
- iv) Write your answers legibly in the lined space provided. It is **NOT** necessary that all lined space is used in answering the questions;
- v) Use **METRIC** measurements only;
- vi) Use black or blue ink only. Pencil can be used for drawing purposes only;
- vii) Where plant names are required, they should include genus, species and where appropriate, cultivar;
- viii) Where a question requires a specific number of answers; only the first answers given that meet the question requirement will be accepted, regardless of the number of answers offered;
- ix) Please note, when the word '**distinct**' is used within a question, it means that the items have different characteristics or features.

ANSWER ALL QUESTIONS

MARKS

Q1 a) A diagram to show the typical proportions of the major components of a fertile top soil.

4



Identify the components of a fertile top soil.

A

B

C

D

b) State **TWO** distinct reasons for the variation of the proportions of parts **A** and **B** on a daily basis.

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c) Describe **TWO** reasons why the soil structure, shown in the diagram, is ideal for plant growth.

4

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Total Mark

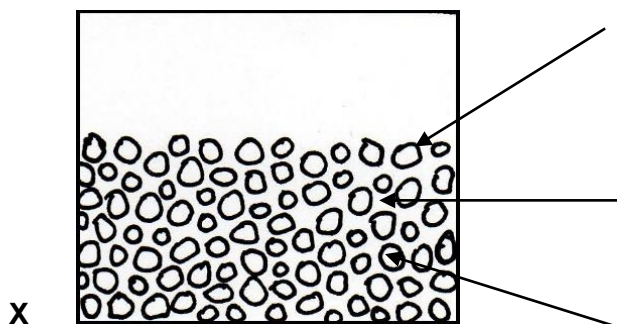
Please see over/.....

Q2 a) Tick **FOUR** statements that indicate soil compaction.

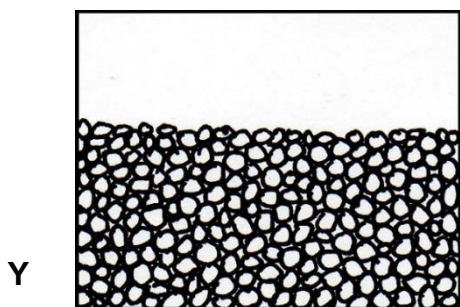
4

Statements	✓
Soil particles are pressed together	
Soil does not wash away in wet conditions	
Small pores in the soil are responsible for drainage	
Fewer large pores are present	
Drainage is unaffected in clay loam soils	
Density of the soil is increased	
Water infiltration is reduced	
All soil pores are reduced	

b) Label the components marked in the diagrams below and indicate which soil shows compaction by circling **X** or **Y**.



4



2

c) State **TWO** methods of reducing soil compaction.

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Total Mark

Please turn over/.....

MARKS

Q3 a) Describe the operation of a domestic wormery under **EACH** of the following headings:

- i) siting of the wormery;
- ii) basic structure of the wormery;
- iii) type of worms used;
- iv) preparing the wormery for composting;
- v) materials placed in the wormery.

- 2**
- 2**
- 1**
- 2**
- 3**

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Total Mark

Please see over/.....

MARKS

Q5 a) Place a line under the **THREE** commonly used fertilisers shown in the list below:

Garden compost

Growmore

Green manure

Rock phosphate

Osmocote

Manure

Ammonium nitrate

Ground dolomite

3

b) State **ONE** soil condition that a fertiliser requires to be effective.

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1

c) State **ONE** suitable method of application for the following types of fertiliser and state **ONE NAMED** garden situation to illustrate its use by completing the table below:

Type of fertiliser	Method of application	Garden situation
Base dressing		
Top dressing		
Liquid feed concentrate		

2

2

2

Total Mark

Please see over/.....

MARKS

Q6 a) List **FOUR** distinct problems associated with growing plants in containers.

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b) Describe **TWO** reasons why garden soil should not be used when growing plants in containers.

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c) Identify **TWO** situations where growing plants in containers is more suitable than growing them in open ground.

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Total Mark

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**The Royal Horticultural Society, Wisley, Woking, Surrey GU23 6QB.
Charity Registration Number: 222879/SC038262**

R2102

PLANT NUTRITION & THE ROOT ENVIRONMENT

Level 2

Monday 5 February 2018

Candidates Registered	888		Total Candidates Passed	605	81.10%
Candidates Entered	746	84.01%	Passed with Commendation	231	30.97%
Candidates Absent/Withdrawn	126	14.19%	Passed	374	50.13%
Candidates Deferred	16	1.80%	Failed	141	18.90%

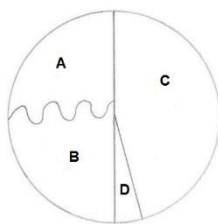
Senior Examiner's Comments:

- 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.
- Candidates must be able to display accurate knowledge of the technical terms and concepts detailed in the syllabus, in the context of horticulture and also 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.
- 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, ensuring that labels are properly attached to the features they describe. Diagrams should preferably be 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. Appropriate feedback must, in any case be provided.

Q1 a) A diagram to show the typical proportions of the major components of a fertile top soil.

4



Identify the components of a fertile top soil.

- A
- B
- C
- D

b) State **TWO** distinct reasons for the variation of the proportions of parts **A** and **B** on a daily basis.

2

c) Describe **TWO** reasons why the soil structure, shown in the diagram, is ideal for plant growth.

4

Q1a) Candidates who were able to identify the components of a fertile top soil gained maximum marks. Acceptable answers included;

- A** Air or water
- B** Air or water
- C** Minerals
- D** Organic matter

Q1b) The best candidates qualified their answers by stating that water levels can increase in a soil due to flooding, heavy rainfall or too much irrigation and air can increase due to drought or lack of irrigation. Water is also lost by evaporation from the soil and by plants taking it up.

Q1c) Many candidates provided good descriptions of the reasons why the soil structure shown is ideal for plant growth and were awarded full marks. These included;

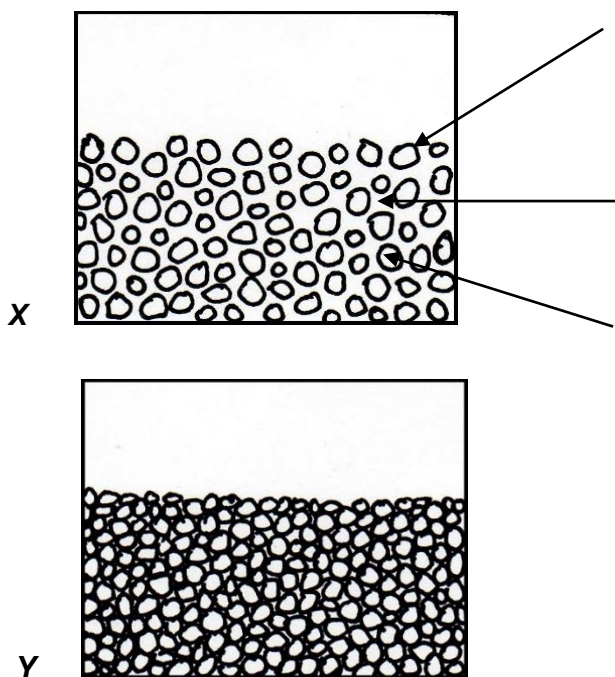
- Water is required for plants to be able to take up plant minerals in solution, to enable photosynthesis to take place and to maintain turgidity of the plant
- Air is required for gaseous exchange to take place at the roots and to provide oxygen for aerobic respiration
- Plant roots can penetrate the soil effectively to anchor the plant and to enable the roots to spread out to reach air and water

Q2 a) Tick **FOUR** statements that indicate soil compaction.

4

Statements	✓
Soil particles are pressed together	
Soil does not wash away in wet conditions	
Small pores in the soil are responsible for drainage	
Fewer large pores are present	
Drainage is unaffected in clay loam soils	
Density of the soil is increased	
Water infiltration is reduced	
All soil pores are reduced	

b) Label the components marked in the diagrams below and indicate which soil shows compaction by circling **X** or **Y**.



4

c) State **TWO** methods of reducing soil compaction.

2

Q2a) The majority of candidates were able to identify which statements indicated soil compaction and gained full marks. These were;

- Soil particles are pressed together
- Fewer large pores are present
- Density of the soil is increased
- Water infiltration is reduced

- Q2b)** Candidates who labelled the components on the diagram correctly as a film of water, air space, soil particle and diagram Y showing compaction gained full marks.
- Q2c)** Suitable methods of reducing soil compaction stated by many candidates who were awarded full marks included; the incorporation of organic matter or sand/grit into the soil, cultivation to aerate the soil and break up any large clods/compaction pans and planting green manure.

Q3 a) Describe the operation of a domestic wormery under **EACH** of the following headings:

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|------|--|----------|
| i) | <i>siting of the wormery;</i> | 2 |
| ii) | <i>basic structure of the wormery;</i> | 2 |
| iii) | <i>type of worms used;</i> | 1 |
| iv) | <i>preparing the wormery for composting;</i> | 2 |
| v) | <i>materials placed in the wormery.</i> | 3 |

Q3a) Most candidates were able to describe the operation of a domestic wormery and gained maximum marks. The best descriptions included the following details;

- i) A wormery should be sited in a sheltered position in the garden or in a shed to avoid extremes of temperature. A temperature of 18 - 25°C is suitable. A wormery can be placed in a utility room or kitchen but there may be problems with smells.
- ii) The basic structure of a wormery should consist of two compartments where the lower one has a sump for collecting liquid with a tap to drain it off. The upper compartment is the composting area where the material is added. The wormery should have a lid to cover it and reduce smells.
- iii) Tiger, brandling or red worms are used in a wormery.
- iv) Approximately 8cm of bedding material, e.g. coir, is placed in the bottom of the top compartment to provide a humid layer for the worms. The worms are added and covered with 8-10cm of material to be composted. This is left for a week to settle before adding any more material.
- v) Materials that can be placed in a wormery include; raw and cooked vegetables and small amounts of tea bags, egg shells, bread, citrus fruit and green leaves, all of which must be chopped up/shredded to increase the surface area.

	MARKS
Q4 a) State what is meant by the term 'mulch'.	2
b) State TWO distinct NAMED garden situations for EACH of the following types of mulch:	
i) <i>organic</i> ;	2
ii) <i>inorganic</i> .	2
c) Describe TWO reasons why organic mulches are more beneficial than inorganic mulches.	4

Q4a) Most candidates correctly stated that a mulch is an organic or inorganic material that is placed on the surface of the soil, and were awarded full marks.

Q4b) The best candidates stated distinct garden situations for each of the types of mulch and gained maximum marks. Suitable answers included;

- i) Organic mulch, e.g. composted bark or leaf mould, can be placed around the base of established plants in borders. Straw type mulches can be placed around crops, e.g. strawberries, to prevent water splash.
- ii) Inorganic mulches, e.g. glass or slate chippings, can be placed on container plants as a decorative mulch. Gravel can be placed on the top of a woven fibre, e.g. mypex, on a garden path.

Q4c) Many candidates were awarded full marks for describing why organic mulches are more beneficial than inorganic mulches. Suitable answers included;

- Organic mulches are incorporated into the soil by soil organisms and are broken down to provide nutrients for plants
- Organic mulches moderate the soil temperature enabling soil organisms to be protected
- Organic mulches will encourage soil organisms which have a positive effect on soil structure

Q5 a) Place a line under the **THREE** commonly used fertilisers shown in the list below:

3

- | | |
|------------------|-----------------|
| Garden compost | Growmore |
| Green manure | Rock phosphate |
| Osmocote | Manure |
| Ammonium nitrate | Ground dolomite |

b) State **ONE** soil condition that a fertiliser requires to be effective.

1

c) State **ONE** suitable method of application for the following types of fertiliser and state **ONE NAMED** garden situation to illustrate its use by completing the table below:

Type of fertiliser	Method of application	Garden situation
Base dressing		
Top dressing		
Liquid feed concentrate		

2

2

2

Q5a) The majority of candidates were able to identify three commonly used fertilisers and gained full marks. These were; Ammonium nitrate, Growmore and Osmocote.

Q5b) Candidates who stated that a soil needs to be moist as fertiliser must be dissolved in water, i.e. soluble, were awarded full marks. Plants can only take up minerals if they are in solution.

Q5c) Candidates who were able to state suitable methods of application for specific types of fertiliser and garden situations for their use achieved full marks.

- **Base dressing** – incorporated into the base of a planting hole for a tree, shrub or hedge
- **Top dressing** – applied to the surface of the soil of established plants in borders or on plants grown in containers
- **Liquid feed concentrate** – needs to be diluted in water and applied to the root zone of tomatoes, container grown plants or specialist plants, e.g. Cactus

	MARKS
Q6 a) List FOUR distinct problems associated with growing plants in containers.	4
b) Describe TWO reasons why garden soil should not be used when growing plants in containers.	4
c) Identify TWO situations where growing plants in containers is more suitable than growing them in open ground.	2

Q6a) Candidates listed a wide range of problems associated with growing plants in containers and gained maximum marks. Suitable answers included;

- Plants can become root bound
- Plants may need to be fertilised
- Containers can become difficult to move if they are large
- Plants can be blown over if the container is not heavy enough
- Permanent plantings require top dressing or repotting
- Plants need to be watered
- Vine weevil can become established in containers

Q6b) The best candidates provided good descriptions why garden soil should not be used when growing plants in containers and were awarded full marks. Acceptable answers included;

- Garden soil has an unknown concentration of nutrients
- Soil structure may be poor/lacking in organic matter/pore space
- Soil texture may be poor, i.e. too much clay/small particles
- Pests and diseases/weed seeds may be present which affect plant growth

Q6c) Most candidates identified situations where growing plants in containers is more suitable and achieved full marks. Acceptable answers included;

- Tender plants can be placed in the correct situation for sunlight/shade, etc.
- Ericaceous plants can be grown in a growing media with a suitable pH
- Containers can be moved to avoid excess rainfall/frost etc.
- Application of nutrients can be controlled when feeding plants
