



Candidate Number:

Candidate Name:

Centre Number/Name:

**RHS (LEVEL 3) ADVANCED CERTIFICATE IN HORTICULTURE
WRITTEN EXAMINATION**

Tuesday 6th February 2007

IMPORTANT – Please read carefully before commencing.

- i) The duration of the papers in Module **A** 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.

Module A

**Plant Propagation,
Growing Media & Plant Nutrition.
Section A – Short Answer Questions**

Please turn over/.....

ANSWER ALL QUESTIONS

MARKS

Q1 State **FOUR** symptoms of nutrient deficiencies in **NAMED** fruit crops.

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Q2 Name **FOUR** exchangeable cations found in soils.

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Q3 Define the term 'leaching' in relation to soils, and state **TWO** methods of prevention.

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Q4 Define the term 'perched' water table.

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Please see over/.....

ANSWER ALL QUESTIONS

MARKS

- Q5** List **FOUR** items of personal protective equipment recommended for the safe movement of bulky growing media by hand.

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- Q6** State **FOUR** indicators of soil compaction.

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- Q7** State **FOUR** factors that need to be considered when selecting a suitable propagating medium for germinating a range of seeds.

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- Q8** Explain how the environment within a fogging unit optimises rooting potential of cuttings.

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Please turn over/.....

ANSWER ALL QUESTIONS

MARKS

Q9 State the use of **EACH** of the following types of budding, providing an appropriate **NAMED** plant example for **EACH**:

- i) 'T' budding;
- ii) Chip budding.

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Q10 Explain the combined effects of temperature and light on germination of a **NAMED** plant seed.

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RHS (LEVEL 3) ADVANCED CERTIFICATE IN HORTICULTURE WRITTEN EXAMINATION

Tuesday 6th February 2007

IMPORTANT – Please read carefully before commencing.

- i) The duration of the papers in Module **A** is **2 hours** .
- ii) Answer **ONE** question from Section **B** and **TWO** questions from Section **C**.
- 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.

Module A

**Plant Propagation,
Growing Media & Plant Nutrition.**

Sections B & C

Structured Questions

Please turn over/.....

Section B - Plant Propagation

Answer **ONE** question only from this section

MARKS

Q1 a) Describe suitable facilities required for the propagation of **EACH** of the following from hardwood cuttings:

- | | | |
|------|--------------------------|----------|
| i) | a deciduous shrub; | 5 |
| ii) | an evergreen shrub; | 5 |
| iii) | a fruit tree root stock. | 5 |

Name a plant example in **EACH** case.

b) Explain the importance of 'cutting selection' and the use of stock plants to produce the correct type of material. **5**

Q2 a) Describe the causes of **FOUR** types of dormancy that inhibit seed germination of woody plants. **8**

b) Explain how dormancy may be broken for **EACH** type of dormancy described in a) with reference to **NAMED** examples of **EACH** type. **12**

Please see over/.....

Section C – Growing Media & Plant Nutrition

Answer **TWO** questions only from this section

MARKS

- Q3 a)** Describe the stages in the break-down of organic matter and explain the role of soil organisms at **EACH** stage. **12**
- b)** Describe the role of nitrogen-fixing organisms using **NAMED** examples. **8**
- Q4 a)** Describe **FOUR** nutrient toxicities, which may occur in soils and the possible cause of **EACH**. **8**
- b)** Explain methods, which may be used in order to prevent or alleviate these situations. **12**
- Q5 a)** State **FOUR** possible causes of soil erosion. **4**
- b)** Describe methods of preventing soil erosion, which may be used in **EACH** situation stated in a). **16**
- Q6** Explain the following processes of soil weathering related to the production of different soil types:
- i) chemical; **10**
 - ii) mechanical. **10**



RHS LEVEL 3 ADVANCED CERTIFICATE IN HORTICULTURE WRITTEN EXAMINATION

Tuesday 6th February 2007

Module A

Plant Propagation, Growing Media & Plant Nutrition

Examiners Report

Candidates Registered	291		Total Candidates Passed		
Candidates Entered	245	84.19%	Passed with Commendation	48	19.59%
Candidates Absent	27	9.28%	Passed	140	57.14%
Candidates Deferred	12	4.12%	Failed	57	23.26%
Candidates Withdrawn	7	2.40%			

General Comments in relation to Questions

Short Answers; they should be just that. However some responses were **very long** & did not fit well in the space provided, this was usually due to a **description** being given in plain language, rather than good use of **technical** horticultural terms. Additionally, answers should only relate to the question that has been set.

Structured questions do not require candidates to write in essay form. It is important that candidates answer questions in a style that is appropriate to the question asked. This requires an understanding of the phraseology used.

It is of vital importance that candidates understand the meaning of the key words used in examination questions and respond accordingly. In many instances full marks could not be awarded because candidates had not understood what was required and as a result did not provide an answer that met the question in full, and thus failed to gain the available marks.

Below is provided a definition of the key words used in questions which may help to clarify the requirement of questions.

State means *to write down the facts briefly*

Describe means– *to give an account of*

Explain means– *to make the meaning clear – (answers will normally need to include details of how, when, why and to relate horticultural practice to underlying scientific principles).*

Evaluate means - *to judge the worth of (state the benefits and limitations of..)*

List means– *to itemise*

Diagrams must be annotated if they are to be of any value. It is advisable (but not essential) to draw them in pencil as mistakes can easily be rectified. The use of colour is a luxury and should only be carried out when clear differentiation is required.

In some instances handwriting again proved to be difficult to decipher. Candidates should remember that if the examiner cannot read what has been written it will not be possible to award any marks.

Wherever possible, named examples should be given in answers as these indicate to the examiner that the candidate has a comprehensive understanding of the subject concerned.

Where a question is set in different sections, eg a,b,c or i,ii,iii, iv candidates are advised to set out their answers to follow the structure of the question, section by section.

Section A – Short Answer Questions

Q1 State **FOUR** symptoms of nutrient deficiencies in **NAMED** fruit crops.

For this question, good symptoms of nutrient deficiencies were usually supplied: but providing fruit crop examples proved more difficult, with a number of vegetables being included, eg Brassicas; Also given were a number of fungal infections, eg. Peach leaf curl.

Marks were gained with the following answers: Inter-veinal chlorosis in Raspberries (Magnesium); Bitter pit in Apple (Calcium); Small pale green foliage in Pears (Nitrogen) & Marginal scorching in Blackcurrants (Potassium).

Q2 Name **FOUR** exchangeable cations found in soils.

A good range of cations was offered by candidates, including Calcium, Magnesium, Sodium & Potassium. The term Nitrogen was too general & a little more detail was required, with Ammonia being accepted, but not Nitrate or Nitrite, as they are anions.

Q3 Define the term 'leaching' in relation to soils, and state **TWO** methods of prevention.

The definition of Leaching: the uncontrolled loss of nutrients, to waste, from a growing media, was well understood, but some confusion was shown with the value of cultivation to prevent it occurring. More direct methods would be the use of overwintering Green Manures, correct calculation & timing of fertilizer application and the use of Organic Matter to improve nutrient retention.

Q4 Define the term 'perched' water table.

The definition of a Perched Water Table: the layer where elevated ground water collects on compacted media that is impervious to water, was very well understood, but there was some confusion with the term Field Capacity: the maximum amount of water held after free drainage,

Q5 List **FOUR** items of personal protective equipment recommended for the safe movement of bulky growing media by hand.

The listing of PPE items that was requested was met in full by most responses: Steel-toe-capped Boots; Overalls/ Coveralls; Gloves & Dust mask/ Goggles, but Wheelbarrows & Trolleys are not PPE but mechanical aids to transport; also Safe Lifting Techniques, although recommended, were not acceptable in this case.

Q6 State **FOUR** indicators of soil compaction.

Four indicators of soil compaction were usually very well stated: Solid Platy surface; lack of worm activity; blue / green worm colour & lack of natural cracks (soil structure), however, surface cracking was taken as a sign of soil structure, a term sometimes confused with texture. It should be noted that the growth of Moss, moisture loving plants & weeds can not be taken as three different indicators.

Q7 State **FOUR** factors that need to be considered when selecting a suitable propagating medium for germinating a range of seeds.

The statements required for this answer were clearly made, but showed two different viewpoints, with one looking from the media view: sterile, capable of providing support, good Air Filled Porosity (AFP) & capable of holding water, and the other from viewpoint of the seed: how long is the germination period?; does it need light?; field or protected site & cost, both environmental and financial. Both sets of information, when clearly made, were accepted.

Q8 Explain how the environment within a fogging unit optimises rooting potential of cuttings.

The environment found within a fogging unit was, in general, well understood. With the high humidity preventing wilting & water loss through transpiration, the unit being automatically adjusted, soft & early cuttings rooting quickly with them having little danger of sun scorch, being some factors that were given in explanation. Some confusion was seen with the fact that the stomata of the cuttings could be open, allowing optimum photosynthesis, when water loss by transpiration is limited by the humidity.

Q9 State the use of **EACH** of the following types of budding, providing an appropriate **NAMED** plant example for **EACH**:

'T' budding;
Chip budding.

For this question a range of plant examples were given, including the 'classical' roses for T budding & apples for chip budding, but named plant examples should always be given their botanical names, with the scion being named, rather than the stock. However, for the use section to this question, eg. Maximum new plants from the minimum scion material & controlling the plant size; this was sometimes not clearly provided or overlooked.

Q10 Explain the combined effects of temperature and light on germination of a **NAMED** plant seed.

Again problems were shown with the request for named plant examples, with the same resulting profile as question 9. However, a strong response was seen with the combined effects on germination, usually, being clearly stated: the correct temperature, right quality & quantity of light being present all together to break seed dormancy, eg. *Betula pendula*. Also noted was the requirement of *Lactuca sativa* to avoid high summer temperatures, greater than 25 degrees C, which results in promoting seed dormancy.

Structured Questions

Section B - Plant Propagation

Q1 a) Describe suitable facilities required for the propagation of **EACH** of the following from hardwood cuttings:

- iv) a deciduous shrub;
- v) an evergreen shrub;
- vi) a fruit tree root stock.

Name a plant example in **EACH** case.

This question was poorly answered and it highlighted both a general lack of exam technique and a poor grasp of practical horticulture. Candidates who described three separate propagation scenarios for a) gained most marks. Candidates who simply repeated the same propagation facilities for each part of question a) thus demonstrating a lack of practical understanding of plant propagation gained least marks, as each cutting type requires distinct environments and facilities.

Too many candidates failed to understand the question and wrote about how to propagate a named deciduous shrub by hardwood cuttings and ignored the need to describe the distinct facilities used for each plant.

Those candidates who provided plant examples using their full Latin names gained full marks for this part of the question.

Candidates should ensure that they provide equal amounts of information for each section of a question, where each part is clearly awarded a similar number of marks.

b) Explain the importance of 'cutting selection' and the use of stock plants to produce the correct type of material.

Part b was generally well answered but as only a maximum of five marks could be obtained in this part of the question, less detailed answers were required. Accurate and complete information pertaining to stock plants and cutting selection gained full marks.

- Q2** a) Describe the causes of **FOUR** types of dormancy that inhibit seed germination of woody plants.
- b) Explain how dormancy may be broken for **EACH** type of dormancy described in a) with reference to **NAMED** examples of **EACH** type.

This question was quite well answered as most candidates provided examples of at least two or three types of dormancy and were able to explain how they could be broken.

Those candidates who scored well provided equal amounts of information for each part of the question. When answering a question of this nature it is important to remember that each part receives the same number of marks, so the examples a candidate selects must reflect this to gain maximum marks. Writing expansively about a hard seed coat in a) can only gain the candidate a maximum of two marks.

Too many candidates ignored the requirement to base their answer on woody plants and this could either reflect their lack of knowledge or their inability to read the question.

Marking this question was made more difficult by instances of some candidates not closely linking a) and b) together. Where this happened the information might have been factually correct, but in the context of this question it was wrong and therefore was awarded no marks.

Those candidates who provided plant examples using their full Latin name gained full marks for this part of the question.

Section C – Growing Media & Plant Nutrition

- Q3** a) Describe the stages in the break-down of organic matter and explain the role of soil organisms at **EACH** stage.

Candidates who planned their answers, responding by identifying the key stages and the organisms that were responsible at each stage earned high marks. It was pleasing to see that the majority of candidates understood this important process and were able to display a good level of technical knowledge. Whilst not specifically required, some candidates provided detailed diagrams depicting the Nitrogen Cycle, but very few linked diagrams to their text. Diagrams are only of value if they are adequately drawn, properly labelled and linked to the text in to order clarify or amplify key points.

- b) Describe the role of nitrogen-fixing organisms using **NAMED** examples. Regrettably a notable number of candidates neglected to name and describe the role of Nitrogen-fixing organisms having already named and described their roles in part a.) of the question. Instead, many candidates spent a great deal of effort discussing the benefits of Mycorrhizal association. A good number of candidates were able to name Rhizobia, Nitrosomonas, Nitrobacter and Azotobacter and provide a concise description of their respective roles, which enabled full marks to be awarded.

- Q4** a) Describe **FOUR** nutrient toxicities, which may occur in soils and the possible cause of **EACH**.

It was noticeable that candidates either provided very good answers or were unable to provide a satisfactory response. In some instances candidates confused deficiencies with toxicities and were not able to provide a possible cause.

- b) Explain methods, which may be used in order to prevent or alleviate these situations.

Methods to control or alleviate the situations cited in a) were in general linked to the problem, however many were not distinct, which made the award of marks difficult. Some candidates chose to cite flushing of toxic elements out of soil into water courses without properly addressing the problem of leachates. Environmentally damaging solutions were not accepted as valid answers and therefore marks were not awarded. It was pleasing to note that some candidate chose phytoremediation as a solution and were able to cite relevant examples of how plants could be used effectively.

- Q5** a) State **FOUR** possible causes of soil erosion.

In response to this part of the question many candidates provided a long description of the possible causes of soil erosion which was not asked for: all that was required was four brief statements that each identified a possible cause of soil erosion. Many of the answers were imaginative, judgement was exercised and if the answer provided was a possible cause of soil erosion marks were awarded accordingly, however glacial, coastal and chemical erosion were not permitted as valid answers as their impact on horticultural activity in U.K. is negligible.

- b) Describe methods of preventing soil erosion, which may be used in **EACH** situation stated in a).

Candidates were in most cases able to describe methods of preventing soil erosion, however many did not link them carefully to the original cause and as a consequence could not be awarded full marks. It was regrettable to note that a limited number of candidates concentrated on defining world problems and ecological disasters but failed to offer any practical solutions to problems of soil erosion.

- Q6** Explain the following processes of soil weathering related to the production of different soil types:

- iii) chemical;
iv) mechanical.

The question required candidates to make the processes of chemical and mechanical weathering clear in respect of the formation of different soil types. In a few instances candidates did not successfully interpret the question and discussed cultivation and soil management rather than considering how soils were originally formed.

It was pleasing to note that some candidates chose to define chemical and mechanical weathering. There is no doubt that this helped to focus their answers in a constructive manner. However, very few candidates were able to clearly explain chemical weathering linking it to the formation of different soil types. Rather more candidates were able to properly explain mechanical weathering and were awarded marks accordingly. It should be noted that some candidates were preoccupied by the

biological factors, specifically the role of plants. The marking scheme was clear, and regrettably, marks could not be awarded except in the case of the mechanical effects of plant roots forcing apart fissures in rock.

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