R2114

UNDERSTANDING PROTECTED ENVIRONMENTS &
THEIR USE IN PLANT CULTIVATION

Level 2

Tuesday 11 February 2020

14:50 – 15:40

Written Examination

Candidate Number: ...........................................................................................................

Candidate Name: ..............................................................................................................

Centre 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 spaces 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. Ensure that all diagrams are labelled accurately with the line touching the named object;

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.
Q1 Describe **ONE NAMED** protective structure suitable for **EACH** of the following:

i) sowing seeds................................................................. 2

ii) displaying tender perennials........................................ 2

iii) growing salad vegetable crops.................................... 2

iv) growing fruit crops..................................................... 2

v) hardening off............................................................. 2

Please see over/..
Q2 a) Describe the effects on plant growth for EACH of the environmental factors listed, by completing the table below.

<table>
<thead>
<tr>
<th>Environmental factor</th>
<th>Effects on plant growth</th>
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</thead>
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<tr>
<td>Low air temperature</td>
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<tr>
<td></td>
<td>2.</td>
</tr>
<tr>
<td>High relative humidity</td>
<td>1.</td>
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<td></td>
<td>2.</td>
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<tr>
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<tr>
<td>Low carbon dioxide</td>
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</tr>
</tbody>
</table>

b) Describe ONE effect of irregular watering for a NAMED crop.
Q3 a) Describe **TWO** methods of changing the relative humidity in a protected environment.

b) Describe **EACH** of the following irrigation systems used in a protected environment:

   i) drip 
   ii) capillary

Please see over/.....
Q4 a) Describe the production of **ONE NAMED** bedding plant under **EACH** of the following headings:

i) propagation and establishment

ii) growing media

**Named bedding plant:**

i)

ii)

b) State the symptoms of a **NAMED** disease of the plant named above.
Q5  Describe the management of *Streptocarpus ionanthus* (formerly *Saintpaulia ionantha*) used for interior display under EACH of the following headings:

i) feeding  
ii) watering  
iii) re-potting  
iv) symptoms and control of ONE NAMED pest

i) ......................................................................................................................
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ii) ......................................................................................................................
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iii) ......................................................................................................................
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iv) ......................................................................................................................
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Please see over/.....
State **TWO** distinct characteristics for **EACH** of the following materials used for plant containers by completing the table below.

<table>
<thead>
<tr>
<th>Material</th>
<th>Characteristic 1</th>
<th>Characteristic 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terracotta</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recycled materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural stone</td>
<td></td>
<td></td>
</tr>
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<td>Reconstituted stone</td>
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</tbody>
</table>

**Total Mark**  

6
R2114

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<table>
<thead>
<tr>
<th>Category</th>
<th>Registered</th>
<th>Percentage</th>
<th>Passed</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td>Candidates Entered</td>
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<td>84%</td>
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<tr>
<td>Candidates Absent/Withdrawn</td>
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<tr>
<td>Candidates Deferred</td>
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<td>Total Candidates Passed</td>
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<td></td>
<td>162</td>
<td>40%</td>
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<td>Passed with Commendation</td>
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<tr>
<td>Passed</td>
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<td>187</td>
<td>47%</td>
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<tr>
<td>Failed</td>
<td></td>
<td></td>
<td>51</td>
<td>13%</td>
</tr>
</tbody>
</table>

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 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.

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.
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.

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.

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.

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.

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.

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) Good descriptions of protective structures suitable for growing specific crops were provided by the best candidates who received maximum marks. These included:

i) **Sowing Seeds** – a glasshouse is usually clad in horticultural glass which has good light transmission and ventilation for plant propagation. The structure can be made from aluminium and galvanised steel and it is able to be heated.

ii) **Displaying Tender Perennials** – a conservatory is usually attached to a house and is glazed to provide good light transmission. Heating enables plants to be displayed all year round.

iii) **Growing Salad Vegetable Crops** – can be carried out using a cloche. Traditional ones are constructed from panes of glass and spring wire clips while others are made using galvanised wire hoops covered in thin polythene.

iv) **Growing Fruit Crops** – can be achieved in a walk-in polythene tunnel. The hoops are made from galvanised steel which are covered with a polythene ‘skin’ which will need replacing every 4-5 years. It can be fitted with a netting skirt to provide more uniform ventilation. Heating and irrigation can also be installed.

v) **Hardening Off** – a cold frame is basically a low box which can be made from wood or brick and covered with ‘lights’ (glass or polycarbonate covers). The frame has sloping sides of $45^\circ$ for maximum light transmission. The cold frame does not have a base and can be positioned directly on soil or a hard surface.
Q2 a) Describe the effects on plant growth for EACH of the environmental factors listed, by completing the table below.

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b) Describe ONE effect of irregular watering for a NAMED crop.

Q2a) Candidates who clearly understood how specific environmental factors affect plant growth achieved full marks. Suitable answers included:

**Low Air Temperature** – causes plants to have poor weak growth and bud initiation.

**High Relative Humidity** – causes the plants to have a reduced uptake of water and nutrients and a greater risk of disease.

**Low Natural Light** - causes the plants to produce spindly, etiolated growth and reduced flowering.

**Low Carbon Dioxide** – causes reduced growth in plants.

Q2b) The majority of candidates described the effect of irregular watering well and gained maximum marks. Acceptable answers included:

Erratic watering of tomatoes can cause the disease blossom end rot and the fruits to split. If there is a dramatic change in watering from drought conditions to the roots being fully saturated damage will be caused to the roots and leaf scorch will occur.
Q3 a) *Describe TWO methods of changing the relative humidity in a protected environment.*

b) *Describe EACH of the following irrigation systems used in a protected environment:*

i) drip

ii) capillary

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Q3a) To achieve full marks candidates were required to describe suitable methods used to change the relative humidity in a protected environment. The best answers included:

**Damping Down** is carried out by spraying water on the concrete paths, benches and sometimes the plants to encourage surface evaporation. Damping Down in hot dry conditions will also reduce air temperatures by leading to an increase in the rate of evaporation. Raising humidity will discourage some pests e.g. glasshouse red spider mite.

**Forced Ventilation** i.e. extractor fans can be used to draw air across the glasshouse. They enable positive air movement across the crop which ensures efficient gaseous exchange. This lowers the relative humidity resulting in fewer fungal diseases.

Q3b) Most candidates were able to describe specific irrigation systems used in a protected environment and were awarded full marks. Suitable answers included:

i) **Drip** – irrigation relies on the delivery of water as a drip to the base of the plant. This system is designed for the water to pass through a series of pipes connected to the mains water supply which become smaller as they get nearer to the plant. It can also be automated by the use of a time clock.

ii) **Capillary** – system of irrigation relies on water moving up by capillary action from a wet or flooded bench which may have capillary matting or sand as its base. The plant determines how much water it requires and takes it up by capillarity. The bench is either always kept wet or flooded periodically for a limited time.
Q4 a) Describe the production of ONE NAMED bedding plant under EACH of the following headings:

i) propagation and establishment
   
ii) growing media

Named bedding plant: ........................................................................................................ 1

Q4b) The best candidates provided good descriptions of specific aspects of the production of a named bedding plant and achieved maximum marks. These included:

i) Propagation and Establishment – Impatiens walleriana is sown broadcast, evenly distributed in trays using seed compost and lightly covered. The seeds are germinated in a closed case at a temperature of 18 - 23°C. Once the seeds have germinated and the cotyledon leaves are fully expanded the seedlings are pricked out into seed trays or modules. Handle the seedlings by the cotyledons only, to prevent damage to the stems and use a dibber to avoid damage to the roots. The plants are grown on at a temperature of 15 - 18°C and watered regularly to avoid them drying out until they are ready to be planted out.

ii) Growing Media – Seed sowing growing media is used for sowing the seeds e.g. John Innes which contains sand to provide good drainage but retains moisture and creates adequate pore space for oxygen. The growing media is low in nutrients. When pricking out the seedlings into modular trays John Innes No.1 can be used which has more nutrients to enable the plants to sustain growth until they are planted out.

Q4b) The majority of candidates named a suitable disease and its symptoms for the chosen bedding plant and received full marks. Acceptable answers included:

Impatiens walleriana is affected by grey mould/botrytis which produces grey/off white or grey/brown fuzzy fungal growth on all of the above ground parts of the plant.
Q5  Describe the management of Streptocarpus ionanthus (formerly Saintpaulia ionantha) used for interior display under EACH of the following headings:

i) feeding  
ii) watering  
iii) re-potting  
iv) symptoms and control of ONE NAMED pest

MARKS

Q5) Candidates who provided good descriptions of the management of Streptocarpus ionanthus achieved maximum marks. Suitable answers included:

i) Feeding – is required to provide sufficient nutrients to maintain plant health and to promote good flowering of the plant. This can be achieved within the growing media as a base dressing at the time of potting or applied periodically during the growing season as a liquid feed. The nutrients can be in the form of a compound, controlled release fertiliser e.g. Osmocote or as an immediate release liquid fertiliser e.g. Miracle Grow to provide potassium for flowering. A foliar feed is not suitable for Streptocarpus ionanthus as the foliage is hairy and water droplets will cause foliage scorch.

ii) Watering – is required on a regular basis to maintain plant health. It must be carried out from below to avoid leaf scorch and to allow capillary irrigation to be used. This provides a higher relative humidity which is also beneficial to the plant. Plants should be kept moist especially during the main growing season.

iii) Re-Potting – is carried out when the plant is pot bound. It is potted into a pot one size larger using John Innes No.2 growing media. The plant is carefully knocked out of its pot, the roots are teased out and any dead or diseased foliage is removed. The plant is placed in the centre of the larger pot and new growing media is gently firmed around it to ensure that it is at the same height as in the previous pot. The crown of the plant must not be buried.

iv) Symptoms and Control of ONE NAMED Pest – e.g. the larvae of vine weevil will eat the roots of Streptocarpus ionanthus causing the growth of the plant to become stunted, wilting and chlorosis as the root system is destroyed. The larvae can be controlled by the use of a biological control i.e. a parasitic eelworm Steinernema kraussei. The nematode is watered onto moist pots from August to September after the adult has stopped laying eggs. The pots must be kept moist for two weeks after application to ensure that all the larvae have been killed.
Q6) State **TWO** distinct characteristics for **EACH** of the following materials used for plant containers by completing the table below.

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Q6) A range of suitable characteristics for specific materials used for plant containers were provided by the best candidates who gained full marks. These included:

**Terracotta** – plants will dry out more quickly, it may not be frost resistant, heavy in weight.

**Recycled Materials** – sustainable material, environmentally friendly,

**Paper** – Lightweight, has a short life, minimises root disturbance at planting.

**Natural Stone** – very heavy in weight, very expensive compared with other materials, aesthetically pleasing.

**Reconstituted Stone** – can look very realistic, has a long life, less expensive than natural stone.

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