R2114

UNDERSTANDING PROTECTED ENVIRONMENTS & THEIR USE IN PLANT CULTIVATION

Level 2

Tuesday 25 June 2019

14:50 – 15:40

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.
Q1 a) Name ONE distinct protected structure suitable for EACH of the following uses:

i) decorative display

ii) crop production

iii) plant propagation

iv) overwintering plants

b) Describe why TWO of the structures named in a) are suitable for that specific use.
Q2 a) Describe the characteristics of TWO NAMED materials suitable for the framework of a protected structure.

b) Name TWO cladding materials suitable for protected structures, stating ONE benefit and ONE limitation for EACH by completing the table below.

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Q3 a) Illustrate how a glasshouse can be ventilated in EACH of the diagrams below, using arrows to indicate the direction of airflow.

**Natural Ventilation**

![Diagram of Natural Ventilation]

**Fan Ventilation**

![Diagram of Fan Ventilation]

b) Describe TWO methods of reducing air temperature within a protected structure (excluding ventilation).

Please see over/....
Q4 a) Name TWO distinct flowering plants suitable for an interior display.

b) State distinct factors to be considered when selecting containers for interior plant display under EACH of the following headings:
   
i) management considerations;
   
ii) visual appeal,

by completing the table below.

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Please turn over/...
Q5  a) Name **ONE** cut flower crop suitable for growing in a protected environment.

b) Name **ONE** suitable protected structure for the flower crop named in a).

c) Describe the production of the cut flower crop named in a) under **EACH** of the following headings:

i) propagation and establishment

ii) plant maintenance

Please see over/....
Q6 Describe the difficulties of maintaining plants for display in domestic buildings under EACH of the following headings:

i) temperature

ii) light

iii) pollution and dust

iv) health and safety

MARKS

3

3

2

2

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Total Mark
UNDERSTANDING PROTECTED ENVIRONMENTS & THEIR USE IN PLANT CULTIVATION

Level 2

Tuesday 25 June 2019

Candidates Registered 762
Candidates Entered 654 86%
Candidates Absent/Withdrawn 96 12%
Candidates Deferred 12 2%

Total Candidates Passed 566 87%
Passed with Commendation 242 37%
Passed 324 50%
Failed 88 13%

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 a) Name **ONE** distinct protected structure suitable for **EACH** of the following uses:

i) decorative display
ii) crop production
iii) plant propagation
iv) overwintering plants

Q1 b) Describe why **TWO** of the structures named in a) are suitable for that specific use.

Q1a) The best candidates were able to provide a suitable protected structure for the specific uses and were awarded full marks. These included:

i) Decorative display – Conservatory
ii) Crop production – Polythene tunnel
iii) Plant propagation – Cold frame
iv) Overwintering plants – Glasshouse

Q1b) Many candidates clearly understood why the structures were suitable for specific uses and gained full marks. Acceptable answers included:

- **Conservatory** is suitable for decorative display as it is likely to be attached to the house which would enable the occupants to gain pleasure from the plants being displayed. It is also more likely that it can be heated efficiently.

- **Polythene tunnel** is suitable for crop production as it provides a warm, humid environment during the spring and summer for optimum growth. Humidity is particularly suited to some crops e.g. self-blanching celery and courgettes.

- **Cold frame** – is an easily constructed and low cost protected area which is suitable for propagation by cuttings as no great height is required.

- **Glasshouse** – is suitable for overwintering plants as it has good light transmission and can be heated to provide frost protection for tender plants.
Q2 a) Describe the characteristics of TWO NAMED materials suitable for the framework of a protected structure.

b) Name TWO cladding materials suitable for protected structures, stating ONE benefit and ONE limitation for EACH by completing the table below.

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Q2a) Candidates described a range of materials suitable for the framework of a protected structure and achieved maximum marks. These included:

Galvanised steel – is steel which has been dipped in zinc to protect it from rusting. It is very strong, heavy, difficult to shape and may rust where cut or bolted. It is usually used for structural supports and guttering of aluminium greenhouses.

Aluminium – is lightweight and not strong enough for structural supports but can be used for glazing bars. It is resistant to corrosion, low maintenance and does not retain heat well.

Wood – e.g. Western Red Cedar is easy to cut and join, is warmer than galvanised steel but has to be thick to be strong. This cuts out light which can result in a shadow effect. Wood will eventually rot and can also warp.

Candidates who confused framework materials with cladding materials could not be awarded any marks.

Q2b) Most candidates were able to name and provide details of suitable cladding materials for a protected structure. Suitable answers which received maximum marks included:
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<td>Horticultural glass</td>
<td>Good light transmission, Long lasting, Relatively easy to clean, Does not deteriorate with age</td>
<td>Heavy to transport, Very fragile and potentially dangerous, Not easy to cut, Not flexible</td>
</tr>
<tr>
<td>Twinned walled polycarbonate</td>
<td>Provides excellent heat retention, Easy to cut, Will bend slightly, Very light to work with</td>
<td>More expensive than horticultural glass, Degrades over time, Less light transmission than glass, Scratches</td>
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Marks were also allocated to candidates who provided details of polyethylene film and acrylic sheets.
Q3 a) Illustrate how a glasshouse can be ventilated in EACH of the diagrams below, using arrows to indicate the direction of airflow.

**Natural Ventilation**

![Natural Ventilation Diagram]

**Fan Ventilation**

![Fan Ventilation Diagram]

b) Describe TWO methods of reducing air temperature within a protected structure (excluding ventilation).

**Q3a)** To achieve full marks candidates were required to illustrate how a glasshouse can be ventilated. The best answers included:

**Natural ventilation**

Cool, less humid air enters a glasshouse through side ventilators. Hot air rises within a glasshouse and exits through the ridge ventilators.

**Fan ventilation**

Air enters a glasshouse through either a large fan or a ventilator at one side of the glasshouse/structure. The air is drawn across the glasshouse and is expelled through a fan on the other side. This results in positive air movement across a crop and provides optimum ventilation.

**Q3b)** The majority of candidates were able to provide good descriptions of suitable methods used to reduce air temperature within a protected structure. These included:

- Damping down pathways with water from a hose pipe will reduce the air temperature by leading to an increase in the rate of evaporation
- Shading the protected structure with the use of shade paint, blinds or shade netting on the outside of the structure will reduce the air temperature
Q4 a) Name TWO distinct flowering plants suitable for an interior display.

b) State distinct factors to be considered when selecting containers for interior plant display under EACH of the following headings:

i) management considerations;

ii) visual appeal,

by completing the table below.

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Q4a) A suitable range of flowering plants were named by candidates who were awarded full marks. These included:

Kalanchoe blossfeldiana, Cyclamen persicum, Saintpaulia ionantha, Euphorbia pulcherrima, Narcissus ‘Tête-à-tête’.

Q4b) Most candidates were able to provide suitable factors relating to management considerations and visual appeal that need to be considered when selecting containers for interior plan display. These included:

i) Management considerations
   - The weight of the container and if it will need to be moved
   - The porosity of the container which will affect the frequency of watering required
   - Type of material used to manufacture the container and its likely life span
   - Maintenance requirements of the container
   - Size of the container with reference to the plant and time span before it requires potting on
   - Position where the container is going to be placed
   - Method used to irrigate the container
ii) **Visual appeal**

- Colour of the container and how suitable it is to its environment
- The material from which the container is made should be appropriate for the image of the building where it is situated
- The container should be balanced in terms of size and shape
- The container should enhance the planting
Q5 a) Name **ONE** cut flower crop suitable for growing in a protected environment.

b) Name **ONE** suitable protected structure for the flower crop named in a).

c) Describe the production of the cut flower crop named in a) under **EACH of the following headings**:

i) propagation and establishment

ii) plant maintenance

Q5a) *Chrysanthemum morifolium* was correctly named by most candidates as a cut flower crop and gained maximum marks.

Q5b) Candidates who named a glasshouse or a polythene tunnel as a suitable protected structure for growing cut flowers achieved full marks.

Q5c) The best candidates provided good descriptions of specific aspects of the production of cut flowers and gained full marks. Suitable answers included:

i) **Propagation and establishment**

*Chrysanthemum morifolium* is propagated from stem tip cuttings 4-5cm in length which are cut just below a node. Medium strength hormone rooting powder can be used to enhance rooting. The cuttings are rooted in a closed case with basal heat at a temperature of 21-24°C which takes approximately 2-3 weeks.

Once rooted the cuttings are planted in slightly raised beds in the border soil. The plants are pinched out once they are established to encourage lateral growth to produce spray Chrysanthemums. The plants are supported by nets which are held by posts driven into the soil around the bed and raised as the plants grow.

ii) **Plant maintenance**

Once established the plants require regular watering which is provided overhead until the flower buds form when it is provided at ground level by drip irrigation.

Plants are monitored for the presence of pests e.g. aphids and red spider mite and diseases e.g. botrytis and powdery mildew. A top dressing of a fertiliser high in potassium is advantageous when flower buds are forming.

The terminal bud on the stem must be removed to produce a spray or the lateral buds must be removed if a single bloom is required.
Describe the difficulties of maintaining plants for display in domestic buildings under EACH of the following headings:

i) temperature
ii) light
iii) pollution and dust
iv) health and safety

Candidates who clearly described the difficulties of maintaining plants for display in domestic buildings for specific factors achieved full marks. Suitable answers included:

i) Temperature
Central heating produces a dry heat/low humidity and the temperature can fluctuate in different rooms depending on their aspect. This is difficult to overcome and can cause plants to wilt and produce stunted growth. The relative humidity can be raised by standing plants in a tray of water.

ii) Light
Light levels can differ depending on the aspect of rooms, the size of windows and the season. Plants may need to be moved according to the season to obtain greater light levels or supplementary lighting can be used. Too high light levels will cause scorching of the leaves and too low light levels will cause spindly growth and etiolation and make plants more susceptible to attack from pests and diseases.

iii) Pollution and dust
Plants in domestic buildings are affected by dust, cigarette smoke and cleaning products by blocking the stomata on the underside of the leaves and coating the upper surface. This reduces the plants’ ability to photosynthesise, looks unattractive and affects plant growth. The foliage of plants should be regularly cleaned/wiped to avoid a build-up of pollutants and dust.

iv) Health and Safety
Plants with spikes and thorns can be dangerous, especially to children. Plants with poisonous parts can also cause allergic reactions. There is also a need to ensure that large plants and containers are stable and cannot fall over and cause injury.