



R2114

**UNDERSTANDING PROTECTED ENVIRONMENTS &
THEIR USE IN PLANT CULTIVATION**

Level 2

Tuesday 6 February 2018

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.

ANSWER ALL QUESTIONS

Q1 a) Name **FOUR** distinct horticultural structures used to grow plants.

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MARKS

4

b) Describe **TWO** of the structures named in a) under **EACH** of the following headings:

- i) clearly labelled outline diagram;
- ii) construction materials.

6

Total Mark

Please see over/.....

MARKS

Q2 a) Name **TWO** environmental factors that a grower would need to control to maintain ideal growing conditions within a protected environment.

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b) Describe **ONE** distinct effect on a growing crop for **EACH** of the factors named in a).

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c) Describe how **EACH** of the factors named in a) can be controlled.

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Total Mark

Please turn over/.....

MARKS

Q3 a) Name **ONE** pest **AND ONE** disease that affect decorative pot plants grown in a protected environment.

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b) State **TWO** benefits **AND TWO** limitations of using cultural and biological methods to control pests in a protected environment by completing the table below.

		Cultural	Biological
Benefits	1		
	2		
Limitations	1		
	2		

2

2

2

2

Total Mark

Please see over/.....

MARKS

Q4 Describe the production of a main season tomato crop under **EACH** of the following headings:

- i) propagation;
- ii) planting and establishment;
- iii) maintenance.

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3
5

i).....

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ii).....

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Total Mark

Please turn over/.....

Q6 Identify the most suitable protected structure for **EACH** of the horticultural activities listed by completing the table below:

- i) growing main season tomato crop;
- ii) covering a row of low-growing soft fruit;
- iii) hardening off;
- iv) establishing a row of salad crops;
- v) propagating young bedding plants in modular containers;
- vi) growing a crop of Poinsettias;
- vii) overwintering a small single plant;
- viii) displaying flowering and foliage plants;
- ix) the production of a cut flower crop;
- x) forcing bulbs.

Protected environment	Activity
Cloche	1. 2.
Cold frame	1. 2.
Conservatory	1.
Walk in polythene tunnel	1. 2.
Glasshouse	1. 2. 3.

2

2

1

2

3

Total Mark

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

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**UNDERSTANDING PROTECTED ENVIRONMENTS &
THEIR USE IN PLANT CULTIVATION**

Level 2

Tuesday 6 February 2018

Candidates Registered	506		Total Candidates Passed	381	94.54%
Candidates Entered	403	79.64%	Passed with Commendation	206	51.12%
Candidates Absent/Withdrawn	93	18.38%	Passed	175	43.42%
Candidates Deferred	10	1.98%	Failed	22	5.46%

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.

- 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
- 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.

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|---|--------------------------|
| Q1 a) Name FOUR distinct horticultural structures used to grow plants. | MARKS
4 |
| b) Describe TWO of the structures named in a) under EACH of the following headings: | 6 |
| i) clearly labelled outline diagram; | |
| ii) construction materials. | |

Q1a) The majority of candidates were able to name a range of structures used to grow plants and gained full marks. Acceptable answers included;

Glasshouse, Polythene tunnel, Cloche, Cold Frame, Conservatory

Q1b) Candidates who provided labelled diagrams and descriptions of the construction materials of the protected structures gained maximum marks.

i) Most candidates were able to provide an outline diagram and gained marks. Incorrectly shaped structures or incorrect positioning of the main features of the structure could not be awarded full marks

ii) **Glasshouse** – Wooden or galvanised steel framework with aluminium or wooden glazing bars to retain the horticultural sheet glass. Strip foundations and single concrete blocks with concrete ‘dollies’ supporting the gutter posts

Cold Frame – Wooden frame retaining sheet horticultural glass supported by brick walls or a wooden frame. Twin walled polycarbonate can be used for glazing instead of horticultural glass as a lighter alternative

	MARKS
Q2 a) Name TWO environmental factors that a grower would need to control to maintain ideal growing conditions within a protected environment.	2
b) Describe ONE distinct effect on a growing crop for EACH of the factors named in a).	4
c) Describe how EACH of the factors named in a) can be controlled.	4

Q2a) Full marks were awarded to candidates who were able to name environmental factors that need to be controlled in a protected environment. These included;

Air temperature, relative humidity, carbon dioxide concentration, freedom from pests and diseases, soil moisture content, light.

Q2b) Air Temperature – Low air temperatures will slow down growth and photosynthesis. More extreme low temperatures can cause frost damage. Temperatures that are too high will also reduce the rate of growth.

Relative Humidity – High relative humidity can increase the incidence of fungal problems. Water and nutrient uptake can also be reduced. Low relative humidity will increase the rate at which plants dry out.

Q2c) Air Temperature – Can be controlled by using a combination of heating during the winter months to maintain an optimum temperature and the use of ventilation or damping down during the summer to lower the temperature.

Relative Humidity – Can be controlled by providing ventilation to lower the relative humidity or by raising the temperature. Relative humidity can be raised by damping down the floors inside the protected structure or by reducing the air flow.

Q3 a) Name **ONE** pest **AND ONE** disease that affect decorative pot plants grown in a protected environment.

2

b) State **TWO** benefits **AND TWO** limitations of using cultural and biological methods to control pests in a protected environment by completing the table below.

		Cultural	Biological
Benefits	1		
	2		
Limitations	1		
	2		

2

2

2

2

Q3a) Most candidates correctly named pests and diseases that affect decorative pot plants and gained full marks. Suitable answers included;

Pests – Aphids, Whitefly, Mealy Bug, Scale Insect

Diseases – Powdery Mildew, Botrytis

Candidates who named physiological disorders could not be awarded any marks.

Q3b) A range of benefits and limitations of using cultural and biological methods of pest control in a protected environment were given by candidates who were awarded full marks. These included;

Cultural Benefits

- No pesticides are used which is better for the environment
- As no pesticides are used there is no clearance period before crops can be sent to market

Biological Benefits

- May be very cost effective if a balance of the pest and the beneficial insect can be maintained
- Pest will not build up a resistance as can happen with the use of pesticides

Cultural Limitations

- May not eradicate the pest
- May not be an option if the pest is well established on the crop

Biological Limitations

- Timing of the introduction of the predator or parasite is often critical
- This method relies on a background presence of the pest which is not acceptable in ornamental pot plant production at the point of sale

Q4 Describe the production of a main season tomato crop under **EACH** of the following headings:

- | | | |
|------|------------------------------------|----------|
| i) | <i>propagation;</i> | 2 |
| ii) | <i>planting and establishment;</i> | 3 |
| iii) | <i>maintenance.</i> | 5 |

Q4) The best candidates provided detailed descriptions of the specific stages involved in the production of a main season tomato crop and were awarded full marks. Suitable answers included;

- i) **Propagation** – Tomatoes are propagated by seed either broadcast in a seed tray or modular trays with one seed per module using seed sowing compost, e.g. John Innes. They are germinated at a temperature of 18-23°C and pricked out into modules or 9cm liner pots. They must be handled carefully by the hypocotyl to avoid damage and moisture must be maintained
- ii) **Planting and Establishment** – The growing method will determine the way in which the tomatoes are planted. Tomatoes may be planted in the ground within the protected structure, in raised beds, grow bags or into rockwool or Nutrient Film Technique (NFT) as a hydroponic system of growing. Points to consider include; depth of planting, firmness, careful handling and grading of plants to maintain uniformity. Supporting strings can be tied to the base of the plant and suspended in the structure
- iii) **Maintenance** – Involves stringing the plants to allow for stem growth, de-leaving the lower leaves to allow the tomatoes to ripen and increase air movement to avoid fungal diseases. Side shoots are also removed to maintain a single growing point and watering and feeding are carried out as required. Relative humidity can be reduced by providing ventilation which will also maintain the ambient carbon dioxide concentration.

Q5 a) Describe the production of *Saintpaulia ionantha* under **EACH** of the following headings:

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|------|--|----------|
| i) | <i>potting up – from a leaf petiole cutting;</i> | 4 |
| ii) | <i>watering;</i> | 3 |
| iii) | <i>feeding.</i> | 3 |

Q5) Many candidates described the specific aspects of the production of *Saintpaulia ionantha* and achieved full marks. Acceptable answers included;

- i) **Potting Up – From a leaf petiole cutting** – Young plantlets must be potted up into 90 or 100mm pots separately to avoid a multi crown plant using an appropriate potting compost, e.g. John Innes No.1. Additional points to consider include the depth of potting (do not bury the central growing point of the plant), centralising the plant in the pot, handling the plant with care to avoid damage and watering the plant in to settle the compost around the root system without wetting the foliage

- ii) **Watering** – Water from below to avoid scorching the hairy leaves of *Saintpaulia ionantha*. The plant will take up water by capillary action as required. Alternatively a drip system can be installed in the pot below the canopy of the foliage. Rain water or soft water is preferable to avoid a build-up of lime in the pot

- iii) **Feeding** – *Saintpaulia ionantha* can be fed using a range of methods. A base dressing can be included in the potting compost to provide a range of major and minor nutrients to be released over a period of time as the plant grows. The plants can also be liquid fed through the irrigation system which could contain specific nutrients, e.g. potassium to encourage improved flowering

Q6 Identify the most suitable protected structure for **EACH** of the horticultural activities listed by completing the table below:

- i) growing main season tomato crop;
- ii) covering a row of low-growing soft fruit;
- iii) hardening off;
- iv) establishing a row of salad crops;
- v) propagating young bedding plants in modular containers;
- vi) growing a crop of Poinsettias;
- vii) overwintering a small single plant;
- viii) displaying flowering and foliage plants;
- ix) the production of a cut flower crop;
- x) forcing bulbs.

Protected environment	Activity	
Cloche	1. 2.	2
Cold frame	1. 2.	2
Conservatory	1.	1
Walk in polythene tunnel	1. 2.	2
Glasshouse	1. 2. 3.	3

Q6) Most candidates were able to identify the protected structures most suited for each of the horticultural activities listed and achieved maximum marks. Suitable answers included;

Protected Environment	Activity
Cloche	1. Covering a row of low-growing soft fruit 2. Overwintering a small single plant
Cold Frame	1. Hardening off 2. Forcing bulbs
Conservatory	1. Displaying flowering and foliage plants
Walk In Polythene Tunnel	1. Establishing a row of salad crops 2. The production of a cut flower crop
Glasshouse	1. Growing main season tomato crop 2. Growing a crop of Poinsettias 3. Propagating young bedding plants in modular containers
