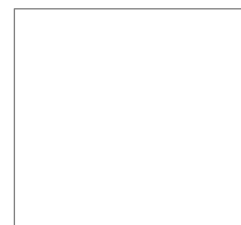




Including examiner comments



R2114

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

Level 2

Tuesday 6 February 2024

15:20 – 16:10

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.

ANSWER ALL QUESTIONS

Q1 Describe **ONE** distinct protected structure for **EACH** of the following uses by completing the table below.

MARKS

Horticultural use	Description of protected structure
Plant propagation	
Growing fruits	
Displaying tender perennials	
Hardening off plants	
Growing salad crops	

2

2

2

2

2

Total Mark

Please see over/.....

MARKS

Q3 Describe how a grower can maximise natural light in a protected structure under **EACH** of the following headings:

- i) site selection
- ii) selection of protected structure
- iii) growing within the structure

3
5
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i)

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ii)

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iii)

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Total Mark

Please see over/.....

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

**RHS LEVEL 2 CERTIFICATE IN THE PRINCIPLES OF GARDEN PLANNING,
ESTABLISHMENT AND MAINTENANCE**

6th FEBRUARY 2024

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 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.

Unit R2114 Understanding protected environments & their use in plant cultivation

Describe **ONE** distinct protected structure for **EACH** of the following uses by completing the table below.

Horticultural use	Description of protected structure
Plant propagation	
Growing fruits	
Displaying tender perennials	
Hardening off plants	
Growing salad crops	

Q1a) The majority of candidates were able to clearly describe protected structures for specific uses and were awarded full marks. Suitable answers included:

Horticultural use	Description of protected structure
Plant propagation	A glasshouse can vary in size but is usually constructed from aluminium with galvanised steel supports and clad in horticultural glass. There are a range of types e.g. mansard, traditional span etc. Ventilation can be provided in the roof and sides along with heating and irrigation.
Growing fruits	A polythene tunnel is a large walk in structure which consists of a polythene sheet (skin) being stretched over galvanised steel hoops. Irrigation and heating systems can be installed in them and the sides can be rolled up for additional ventilation.
Displaying tender perennials	Conservatory is an ornate structure which is generally attached to the wall of a house. They are usually covered in glass or polycarbonate and are heated.
Hardening off plants	Cold frames are low boxes which can be made from wood or brick with glass or polycarbonate lights (frames) on top.
Growing salad crops	Cloches, which are small, temporary and moveable covers for crops. They can be made from glass panes and metal clips or plastic film which is stretched over wire hoops.

Describe **EACH** of the following methods of irrigation stating **ONE** benefit and **ONE** limitation for **EACH**.

- i) capillary
- ii) hose pipe

Q2) A range of benefits and limitations of specific methods of irrigation were provided by many candidates who gained maximum marks. These included:

i) **capillary**

This method relies on capillary action from wet sand or capillary matting. The bench has to be level and the pots are stood directly onto the sand or matting. The sand or matting is kept moist allowing the plant to take up water by capillary action. This type of irrigation reduces the amount of weed growth on the top of the pot as it is dry but can cause problems if mineral salts build up in the sand or matting. Rooting through can also become a problem if there has not been adequate moisture in the pots.

ii) **hose pipe**

This method of irrigation is labour intensive and requires a rose or lance to be fitted to the end of the hose pipe to direct the water without damage being caused to the plants. A hose pipe is beneficial when watering individual plants providing the exact amount of water each plant requires. A hose pipe can be problematic as the droplet size could be variable and flow rate can be affected by water pressure. A hose pipe could be used in conjunction with a sprinkler system.

Describe how a grower can maximise natural light a protected structure under **EACH** of the following headings:

- i) site selection
- ii) selection of protected structure
- iii) growing within the structure

Q3) Candidates who had a good understanding of how a grower can maximise natural light in a protected structure gained full marks. Suitable answers included:

i) **site selection**

It is important for the glasshouse to be orientated east to west to ensure that maximum light transmission occurs. There will be less structural material e.g. glazing bars to obstruct light. There should not be any trees or high hedges to obstruct the winter light as the angle of the sun becomes lower in the winter and the light intensity is reduced.

ii) **selection of protected structure**

It is important to consider the overall shape of the structure e.g. curvilinear, mansard etc. one with high eaves which will maximise the angle of incidence for maximum light transmission. A protected structure constructed from aluminium and steel which are stronger materials will allow more light into the structure compared to wood which requires thicker glazing bars and therefore blocks out more natural light. The cladding material is also important as horticultural glass will enable maximum light transmission compared to twin walled polycarbonate or polythene film.

iii) **growing within the structure**

The cladding material must be kept clean and training and support systems can be used to maintain maximum light access to crops. The use of well-placed overhead benches/shelves will avoid shading from plants placed on the higher benches.

Describe the production of a tomato crop (*Solanum lycopersicum*) grown under protection under **EACH** of the following headings:

- i) propagation
- ii) establishment

Q4) Good descriptions of the production of a tomato crop grown under protection were provided by the best candidates who were awarded maximum marks. These included:

i) **propagation**

Tomatoes are grown from seed which can either be space sown in standard seed trays or in modular trays. The seeds are lightly covered with sieved compost. A John Innes seed compost can be used. This will have good drainage but retain adequate levels of moisture. All containers must be clean and mains water must be used at all times to avoid fungal diseases e.g. damping off. Tomatoes can be germinated on a heated bed at a temperature of 21-23°C and will germinate in 2-3 weeks.

ii) **establishment**

Once the tomato seeds have germinated and the cotyledon leaves have fully expanded the seedlings that have been sown in trays require pricking out. The seedlings can be pricked out into 9cm pots using a John Innes No. 1 potting compost which contains a small amount of nutrients. The seedlings must be handled by the cotyledon leaves to avoid damage to the hypocotyl. Seeds that were germinated in modules can be potted up. All plants can be grown on in a glasshouse on an open bench until the required size for planting.

State **TWO** reasons for providing ventilation in a glasshouse.

Describe how **EACH** of the following methods of ventilation work in a glasshouse

- i) Natural Ventilation
- ii) Forced Draught or Fan ventilation

Q5a) Full marks were achieved by candidates who were able to give reasons for providing ventilation in a glasshouse. Acceptable answers included:

- to regulate temperature
- to regulate humidity levels
- to prevent fungal diseases
- to provide carbon dioxide depleted by the plants.

Q5b) The best candidates were able to provide good descriptions of how specific methods of ventilation work in a glasshouse and gained maximum marks. These included:

i) **natural ventilation**

Natural ventilation is where natural air movement is used to achieve effective glasshouse ventilation. Both the ridge and side/louvre ventilators are used. As air in the glasshouse warms it rises creating convection air currents. The warm air escapes through the ridge ventilators. This creates a weak vacuum into which cool air can enter through the side/louvre ventilators. This is a low energy method of ventilation which can be thermostatically controlled.

ii) **forced draught or fan ventilation**

Forced draught or fan ventilation uses a much greater energy input. It relies extractor fans which are installed on one side of the glasshouse. Air is forced out of the glasshouse while fresh air enters through a natural ventilator on the other side of the glasshouse. This ensures a slow movement of air within the glasshouse. This method of ventilation can be thermostatically controlled.

State **FOUR** factors to consider when selecting a suitable growing media for houseplants.

Describe **THREE** maintenance tasks carried out on the houseplant *ficus benjamina*.

Q6a) Most candidates were able to provide a range of factors to consider when selecting a suitable growing media for houseplants and were awarded full marks. Suitable answers included:

- drainage – must have good air-filled porosity with the ability to retain moisture
- provide anchorage for the plant
- provide suitable nutrition over an extended period of time
- pH – suitable for the plant being grown.

Q6b) A range of maintenance tasks were described by candidates who achieved full marks. These included:

Leaf cleaning should be carried out on a regular basis using a damp cloth to remove dust particles.

Monitoring for pests and diseases e.g. mealy bug or scale insect. If present in the axils of the leaf wipe off with a wet cloth or use biological control methods e.g. *Cryptolaemus* larvae (ladybird) for mealy bug.

Watering should be carried out on a regular basis when the compost is dry or shrinking away from the edge of the pot or the pot is light in weight. It is preferable to water from the base of the container to avoid the presence of sciarid fly on the top of the compost. Drain off any excess water one hour after watering.