



**RHS LEVEL 3 ADVANCED/DIPLOMA IN HORTICULTURE
WRITTEN EXAMINATION**

**Wednesday 9th February 2011
10:00am – 12noon**

MODULE D

**Outdoor Plant Production
Protected Plant Production**

Section A – Short Answer Questions

Candidate Number:.....

Candidate Name:.....

Centre Number/Name:.....

IMPORTANT – Please read carefully before commencing.

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

Please turn over/.....

ANSWER ALL QUESTIONS

		MARKS
Q1	State FOUR main factors to be considered when equipping a packhouse for tree fruit crops.	2
	
	
	
	
	
Q2	State the optimum harvesting stage and condition for a NAMED outdoor salad crop.	2
	
	
	
	
	
Q3	List FOUR reasons why cut flowers may deteriorate after harvesting.	2
	
	
	
	
	
Q4	Describe the pruning operations carried out for a NAMED cane fruit.	2
	
	
	
	
	

Q5 Explain **TWO** benefits of using a 'bed system' for commercial vegetable production. **2**

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Q6 State **TWO** advantages and **TWO** limitations of a **NAMED** type of irrigation system, used for a **NAMED** pot plant grown under protection. **2**

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Q7 Explain the importance of good packaging when marketing a **NAMED** crop grown under protection. **2**

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Q8 List **FOUR** hazards to workers when harvesting tomatoes within a protected environment. **2**

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Q9 List **TWO** advantages and **TWO** limitations of buying in plug-raised plants in commercial bedding production. **2**

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Q10 Assess **TWO** advantages to the consumer of organic produce. **2**

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**RHS LEVEL 3 ADVANCED/DIPLOMA IN HORTICULTURE
WRITTEN EXAMINATION**

**Wednesday 9th February 2011
10:00am – 12:00noon**

MODULE D

**Outdoor Plant Production,
Protected Plant Production**

Sections B & C - Structured Questions

IMPORTANT – Please read carefully before commencing.

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

Please turn over/.....

Section B – Outdoor Plant Production

Answer TWO questions from this section

MARKS

Q11 Describe the production of a **NAMED** perennial cut flower crop grown in the open, under **EACH** of the following:

- | | | |
|------|--|---|
| i) | establishment; | 5 |
| ii) | seasonal management; | 5 |
| iii) | process of harvesting; | 5 |
| iv) | storage, marketing and extending shelf-life. | 5 |

Q12 a) Describe the techniques and resources for mechanically harvesting a **NAMED** vegetable crop. 10

b) Describe how harvesting techniques and post-harvest treatments affect the saleability and storage life of vegetables. 10

Q13 Describe the production and harvesting of **EITHER** a crop of strawberries, **OR** a **NAMED** tree fruit, under **EACH** of the following headings:

- | | | |
|------|--|---|
| i) | ground or site preparation and crop establishment; | 5 |
| ii) | managing nutrients; | 5 |
| iii) | managing crop health and growth; | 5 |
| iv) | harvesting. | 5 |

Q14 Describe the production of a **NAMED** bareroot tree, under **EACH** of the following:

- | | | |
|------|--------------------------|---|
| i) | site requirements; | 5 |
| ii) | annual maintenance plan; | 5 |
| iii) | harvesting and grading; | 5 |
| iv) | packhouse requirements. | 5 |

Please see over/.....

Section C – Protected Plant Production

Answer **ONE** question only from this section

MARKS

- | | | | | |
|------------|----|------|---|-----------|
| Q15 | a) | i) | Explain how the shape of a 'growing structure' can affect natural light transmission. | 4 |
| | | ii) | Describe how orientation is important when siting 'growing structures' for a NAMED crop. | 6 |
| | | iii) | List FOUR other ways by which a grower can maximise natural light entry. | 2 |
| | b) | | Compare the effectiveness of alternatives to glass as cladding for a 'growing structure'. | 8 |
|
 | | | | |
| Q16 | a) | | NAME FOUR environmental factors routinely controlled within the protected growing environment. | 2 |
| | b) | | For EACH environmental factor named in a): | |
| | | i) | state the equipment used to monitor environmental factors; | 2 |
| | | ii) | state the units of measurement used; | 2 |
| | | iii) | explain the reasons for monitoring these factors. | 4 |
| | c) | | Evaluate the use of IT facilities for environmental control. | 10 |

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RHS LEVEL 3 ADVANCED/DIPLOMA IN HORTICULTURE WRITTEN EXAMINATION

10:00am Wednesday 9th February 2011

MODULE D

Outdoor Plant Production Protected Plant Production

Candidates Registered	19		Total Candidates Passed	10	76.92%
Candidates Entered	13	68.42%	Passed with Commendation	3	23.08%
Candidates Absent	6	31.58%	Passed	7	53.85%
Candidates Deferred	0	-	Failed	3	23.08%
Candidates Withdrawn	0	-			

Section A – Short Answer Questions

Q1 State **FOUR** main factors to be considered when equipping a packhouse for tree fruit crops.

The following main factors for equipping this type of packhouse should be considered:

- separate entrances for harvested and despatched fruit,
- equipment for inspection and grading,
- good lighting and working conditions for staff, and
- storage facilities.

Q2 State the optimum harvesting stage and condition for a **NAMED** outdoor salad crop.

Lettuce, including a range of types, was the most popular example. Marks were awarded for stating the importance of the correct size and good tight heads, free from blemishes, pests and diseases. Harvesting early in the day and keeping as cool as possible were included by some candidates.

Q3 List **FOUR** reasons why cut flowers may deteriorate after harvesting.

Reasons included excess heat, pests and diseases, lack of water, harvesting at the wrong stage and the harmful effect of ethylene. Marks were lost when candidates duplicated some of their answers.

Q4 Describe the pruning operations carried out for a **NAMED** cane fruit.

All candidates gave Raspberry as their named cane fruit example. Candidates lost marks by confusing the differences between autumn and summer fruiting crops. Only one example was required. Summer fruiting raspberries require pruning as soon as possible after fruiting, removal of unwanted canes and tying into the wires. The importance of removing prunings was also listed by some candidates.

Q5 Explain **TWO** benefits of using a 'bed system' for commercial vegetable production.

There are several benefits of the bed system, including reduced compaction, better use of the land, more uniform crops and fertiliser applied to the correct situation. The question, however, stressed a 'commercial' situation and marks were lost when small scale raised beds were used as examples.

Q6 State **TWO** advantages and **TWO** limitations of a **NAMED** type of irrigation system, used for a **NAMED** pot plant grown under protection.

Candidates usually correctly named a relevant pot plant and suitable irrigation system. Trickle irrigation with one nozzle per pot has the advantages of being direct, avoids wetting the foliage and can be applied as a measured dose. Limitations included the necessity for good management and regular maintenance. Some candidates only gave advantages; others did not clearly specify the difference between advantages and limitations.

Q7 Explain the importance of good packaging when marketing a **NAMED** crop grown under protection.

It was essential to correctly name a suitable crop. Good answers included the importance of protecting the crop, promoting the crop to potential buyers, EU grading essentials - naming variety, weight and class. Marks were lost through failure to answer the question and simply stating how to pack.

Q8 List **FOUR** hazards to workers when harvesting tomatoes within a protected environment.

This was well answered. Marks were awarded for "trip" hazards by a range of items. Physical damage to operators from handling excessive weights, injury from cuts and exposure to pesticides through the lack of using protected clothing were all acceptable. Marks were lost when hazards were not clearly stated.

- Q9** List **TWO** advantages and **TWO** limitations of buying in plug-raised plants in commercial bedding production.

The buying in of plug-raised plants in commercial bedding production is well established. Candidates demonstrated that they were familiar with this technique. The advantage to the grower is not requiring expensive specialised equipment and labour for producing quality plugs. Limitations included possible restrictions in the choice of quality and variety, the risk of introducing pests and diseases and extra costs.

- Q10** Assess **TWO** advantages to the consumer of organic produce.

Only two advantages were required. Most candidates gained full marks by listing growing without chemicals, no potential health risks, use of biological control methods and grown to specific standards. Some advantages although often quoted are difficult to prove, but marks were still given for improved flavour and often locally produced.

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Structured Questions

Section B – Outdoor Plant Production

Q11 Describe the production of a **NAMED** perennial cut flower crop grown in the open, under **EACH** of the following:

- i) establishment;
- ii) seasonal management;
- iii) process of harvesting;
- iv) storage, marketing and extending shelf-life.

Candidates gaining good marks in this question were those who were able to demonstrate that they had knowledge of commercial production of flower crops.

Candidates who were familiar with specific crop requirements were able to gain good marks by describing how the site was selected and prepared for planting the crop. Marks were awarded for describing the source of plant material, including how the plants were propagated. They were expected to explain planting by providing details of spacing, methods and timings. Actions to improve establishment were given marks. Many candidates lost marks by providing vague, generic information.

The question asks for a description of management of a perennial cut flower all year round. Candidates who were able to take a season by season account relating it to the recurring growing cycle scored well but many only included a part of the management or provided vague information.

Candidates were awarded good marks for demonstrating knowledge of how criteria such as growth stage and market influence decisions regarding harvesting. This part of the question links closely to the seasonal management and to the marketing part of the question. Some candidates showed excellent knowledge of the harvesting criteria but then failed to explain how the harvesting is done in practice. Knowledge of the immediate post harvest treatment was needed to get high marks in this section.

Many candidates gained marks by identifying the use of solutions and cooling to extend shelf-life. They were able to explain the science behind storage, but lost marks because they did not explain how it is put into practice; the facilities and the limitations. Few candidates described the marketing or the opportunities for direct selling or other options for selling the crop and lost marks.

- Q12** a) Describe the techniques and resources for mechanically harvesting a **NAMED** vegetable crop.
- b) Describe how harvesting techniques and post-harvest treatments affect the saleability and storage life of vegetables.

Gaining good marks in the first part depended on selecting a suitable crop that is normally harvested mechanically. Good examples included root crops that are grown on a large scale, crops that are harvested using mobile packing machines (rigs) or sprouts grown on a large scale.

This question was only tackled by a small number (less than 25%) of candidates. To obtain high marks required the candidate to show good first-hand knowledge of commercial vegetable production and mechanised harvesting. The question was easier to answer when candidates could outline the production process leading up to harvest and be able to identify the state of the crop and ground conditions at the time of harvest. To gain high marks the candidates needed to demonstrate knowledge of the range of machinery for preparing, harvesting and transporting the crop. They needed to be able to describe the impact of mechanisation on the harvesting process and be able to use appropriate technical terms.

The second part of the question asks for candidates to demonstrate a broad knowledge of the factors influencing the storage of a range of crops. Candidates gained good marks for describing how timing and the state of the crop, choice of machinery and operation of the machinery influence storage, using a range of crops as examples. Good marks were available for describing appropriate storage conditions, the crops they could be applied to and how storage is achieved in commercial practice.

Candidates who achieved high marks were able to demonstrate they understood the scientific principles of plant physiology and its relationship to crop storage. Many candidates made answering the question difficult by discussing a single crop and explaining how it is treated and stored.

Q13 Describe the production and harvesting of **EITHER** a crop of strawberries, **OR** a **NAMED** tree fruit, under **EACH** of the following headings:

- i) ground or site preparation and crop establishment;
- ii) managing nutrients;
- iii) managing crop health and growth;
- iv) harvesting.

Most candidates tackled this question and some scored very good marks for it. Most candidates showed a good basic understanding of the principles of fruit production.

Some candidates made answering the question difficult by selecting a single variety of the crop e.g. Bramley's Seedling rather than selecting "Apples". Candidates had the opportunity to select a strawberry crop by confining their answers to "open ground strawberries" or "strawberries under polythene". Equally the candidate could have chosen to narrow the topic down by selecting organic, or intensive, or cider apples and still get good marks.

Candidates who were familiar with all aspects of fruit production were able to obtain high marks. They were able to describe in detail the processes involved in growing the crop, giving information about nutrient requirement (rather than "... apply fertilizer if required"), diseases and pests and their control and were able to score good marks.

Candidates need to avoid expressions such as "apply correct nutrient" or "prune as appropriate". These gain no marks.

Q14 Describe the production of a **NAMED** bareroot tree, under **EACH** of the following:

- i) site requirements;
- ii) annual maintenance plan;
- iii) harvesting and grading;
- iv) packhouse requirements.

This question was tackled by over half of candidates. Some scored very good marks, as always the candidates who had first-hand experience of crop production scored best marks.

Whilst the question asks the candidate to describe the production of a named bare-root tree, candidates with experience of the nursery stock industry gained good marks by describing the general site requirements for growing crops of trees for lifting and selling bare-root. Most candidates gained good marks for describing the soil type and topography, but didn't score the maximum by not identifying access to services, irrigation or proximity to pack-houses and stores.

Marks were available for describing the month-by-month or seasonal changes in maintenance. Many candidates did not outline the production process from the propagation stage to selling and its timing. It therefore became harder to describe the annual maintenance. Marks were available for describing propagation, identifying how weed control is done, monitoring and control of P&D, pruning and support (if appropriate) and how irrigation and nutrient needs are met.

The third part of the question this question required the candidate to demonstrate a general knowledge of how bare-root trees are harvested. Marks were awarded for describing the timing and conditions for lifting the crop, how the crop is harvested, graded, bundled and labelled and how it is treated in the pack-house or storage area.

Pack-house requirements vary enormously depending on the size and type of nursery as well as the customer type. Candidates could score good marks for describing the packing requirements of the specific crop chosen and relating it to the wider requirements of the nursery, or by describing the wider requirements of the nursery and relating it to the selected crop.

Candidates scored good marks for discussing the equipment and its usage, and storage was generally answered well. Few candidates recognised that marks were available for the welfare and communications aspects of the packhouse.

Section C – Protected Plant Production

- Q15 a) i) Explain how the shape of a 'growing structure' can affect natural light transmission.

Most candidates identified the angle at which light strikes the glass as being critical. However few were able to name it as 'the angle of incidence' and explanations were sometimes confused and very brief containing few facts. The significance of this in structure design was also overlooked. Dome shaped structures, mansards or the selection of structures with high eaves were often not included.

- ii) Describe how orientation is important when siting 'growing structures' for a **NAMED** crop.

The position of the structure in relation to the points of the compass was included in most candidates' answers. However the significance of this in terms of presenting most glass to the sun and the implications of how this affected the situation when a crop was introduced, was not well understood. Most candidates were able to name a suitable crop but the shading effect of tall crops making an E/W orientation less desirable was not included in most answers.

- iii) List **FOUR** other ways by which a grower can maximise natural light entry.

Not many candidates gained full marks for this part of the question. Several repeated orientation as providing significant improvement. Others included supplementary lighting while some described ways in which light can be bounced off the floor of the structure or objects within it after it had already passed into the growing structure. Obvious answers like the cleanliness of the glass or avoiding a shaded site or the selection of cladding material were not usually given.

- b) Compare the effectiveness of alternatives to glass as cladding for a 'growing structure'.

Candidates could in the most part name alternatives to glass but their ability to compare their effectiveness with glass as a cladding material was limited. It was good to see some candidates including some of the very modern polythene multi-skinned alternatives which have only recently come onto the market. Some candidates overlooked polythene as a material which seriously reduced the range and scope of the answers they were able to provide. Secondary glazing materials used inside the primary cladding for shading or insulation purposes were sometimes confused with primary cladding materials. The insulating properties of twin walled polycarbonate materials was often overlooked completely by candidates.

- Q16** a) **NAME FOUR** environmental factors routinely controlled within the protected growing environment.

This was well answered in general, with most candidates being able to name four factors. Few candidates were very specific when including temperature and did not specify whether it was air or soil temperature. Most chose aerial environmental factors but soil-based factors could be, and in some cases were, included.

- b) For **EACH** environmental factor named in a):

- i) state the equipment used to monitor environmental factors;

There was some confusion between the function of thermometers, whirling hygrometers and wet and dry bulb thermometers. Some candidates included Stevenson screens or aspirated screens as equipment used to monitor temperature but did not include reference to the thermometer. Soil tensiometers were not included where candidates had chosen soil moisture as a factor.

- ii) state the units of measurement used;

This was not always well understood, sometimes leading to confused answers including several candidates unable to provide a unit of measurement for relative humidity.

- iii) explain the reasons for monitoring these factors.

Answers were lacking in clarity with confusion over the significance of low or fluctuating temperatures to the plant. The importance of adequate light and humidity were also not clearly understood. Some candidates included their importance in relation to conservation of energy as well as their importance to the growing plant. This was an acceptable response to this question.

- c) Evaluate the use of IT facilities for environmental control.

A few candidates did not attempt this part of the question at all. Those who did answer it included a good range of uses for IT facilities within the area of environmental control. Most appreciated the advantage of accuracy and flexibility of control afforded to facilities where IT control was available. Some key advantages and limitations were however overlooked but the answers provided did in the most part illustrate a good understanding of the use and application of IT for environmental control.

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