



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

10:00am Wednesday 7th July 2010

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 List **FOUR** methods to extend the harvest period of strawberries.

2

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Q2 Identify how the shelf life of a **NAMED** tree fruit can be enhanced by **ONE** pre and **ONE** post harvest treatment.

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Q3 State **FOUR** criteria for the EU (European Union) grading of a **NAMED** fruit crop.

2

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Q4 Describe the optimum stage of development required for harvesting a **NAMED** outdoor cut flower.

2

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Please see over/.....

ANSWER ALL QUESTIONS

MARKS

- Q5** List **FOUR** examples of mechanical equipment available for the production of container grown plants.

2

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- Q6** List **FOUR** ways to control **ONE NAMED** environmental factor within a protected structure.

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- Q7** List **FOUR** main design features of modern greenhouses.

2

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- Q8** State **TWO** advantages and **TWO** limitations of applying liquid feed into irrigation water.

2

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Please turn over/.....

ANSWER ALL QUESTIONS

MARKS

Q9 Explain how the time of the year affects the quality of natural light.

2

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Q10 Describe **TWO** mechanical methods for removing conifers from the ground for root-balling.

2

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10:00am Wednesday 7th July 2010

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 how mechanisation can be applied to EACH of the following aspects for EITHER top OR soft fruit production:	
	i) ground preparation and tillage;	5
	ii) control of unwanted vegetation;	5
	iii) control of pests and diseases;	5
	iv) harvesting including transportation to storage.	5
Q12	a) Describe, using a NAMED example for EACH , how container plants grown for sale can be propagated by the following methods:	
	i) seed;	5
	ii) vegetative.	5
	b) Describe an annual routine maintenance plan required for container grown plants on the stock beds.	5
	c) Explain the importance of grading in the production of container grown plants for a NAMED market.	5
Q13	Describe the production of EITHER a NAMED fruit, salad OR vegetable crop, to meet organic status under EACH of the following:	
	i) management of the soil;	8
	ii) pest, disease and weed control.	12
Q14	a) Review the main factors to be considered when designing a packhouse for the handling of EITHER tree fruit, nursery stock OR vegetables.	15
	b) Identify the hazards associated with the operation of a packhouse.	5

Please see over/.....

Section C – Protected Plant Production

Answer **ONE** question only from this section

		MARKS
Q15	a) State FOUR factors to be considered when choosing an irrigation system for protected cropping.	2
	b) Describe, with the aid of clearly labelled diagrams, THREE methods of irrigating container grown plants in commercial production.	12
	c) List TWO advantages and TWO limitations of EACH method named in b), when using this method of irrigation.	6
Q16	Describe the production of a main season tomato crop under EACH of the following headings:	
	i) growing system;	5
	ii) growing from seed to 'planting out';	5
	iii) trimming and training;	5
	iv) integrated pest management.	5



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MODULE D

Outdoor Plant Production Protected Plant Production

Candidates Registered	31		Total Candidates Passed	16	61.54%
Candidates Entered	26	83.87%	Passed with Commendation	1	3.85%
Candidates Absent	4	12.90%	Passed	15	57.69%
Candidates Deferred	1	3.23%	Failed	10	38.46%
Candidates Withdrawn	0	-			

Section A – Short Answer Questions

Q1 List **FOUR** methods to extend the harvest period of strawberries.

Using a range of techniques strawberries can now be harvested over a long period. The use of "Spanish" tunnels, especially used in Herefordshire make harvesting easier for pickers.

Half a mark was awarded for each of the following (four required);
selection of suitable varieties, using cold stored runners, staging planting dates and growing under several types of protection.

Marks were lost when distinct methods were not listed, e.g. early, mid- season and late varieties could not be credited as three methods.

- Q2** Identify how the shelf life of a **NAMED** tree fruit can be enhanced by **ONE** pre and **ONE** post harvest treatment.

Shelf life refers to the harvesting period to sales by the retailers of fresh produce. It was essential to name a relevant tree fruit, where omitted all marks were lost for this question. Some candidates gave full details of long term storage which was not required.

1 mark was allocated for a pre harvest treatment which could include good management in the orchard and timing of harvesting. 1 mark for careful handling at all stages and keeping the fruit cool.

- Q3** State **FOUR** criteria for the EU (European Union) grading of a **NAMED** fruit crop.

Candidates need to keep up to date with the regulations and changes which take place. A named fruit was essential, omitted by some candidates who lost the two marks for this question.

Half a mark was allocated for any FOUR correct criteria which included; naming of the variety, free from blemishes, weight of fruit, class and country of origin. Some candidates were not familiar with the regulations and tended to make calculated “guesses”, including repetition of a range of blemishes. Country of origin was rarely mentioned.

- Q4** Describe the optimum stage of development required for harvesting a **NAMED** outdoor cut flower.

One check list would be to consider what a florist or wholesaler would require. Two marks were allocated for a suitable flower, at the correct stage of development, including long straight stems, free from pests and diseases and fresh looking. Candidates were able to name a relevant cut flower and Helianthus, sunflowers, proved popular with a number indicating the recent developments of this flower. Marks were not given for simply stating “once sufficient buds were open “.

- Q5** List **FOUR** examples of mechanical equipment available for the production of container grown plants.

Half a mark was awarded for each correct example.

This question was clearly understood by candidates and most were able to gain full marks.

Correct answers included a range of labour saving equipment used in propagation; seeding machines, potting machines, conveyors, fork lifts and transplanters.

- Q6** List **FOUR** ways to control **ONE NAMED** environmental factor within a protected structure.

Half a mark was awarded for each correct way. Candidates could select from temperature, humidity, light and water.

Excellent answers were given for temperature and humidity.

To gain full marks for temperature four of the following were required ; ventilation equipment, computer controlled systems, thermal screens, shading equipment and adequate heating systems.

Q7 List **FOUR** main design features of modern greenhouses.

Half a mark was awarded for each design feature.

The importance of good light, through large panes of glass, easy access for equipment by providing large doors and freedom from obstruction. Equipment built into the design specifications was included, computerised equipment to control heating, irrigation and ventilation.

Some candidates gave specific examples of types of greenhouses, modern Venlos and widespan models.

Q8 State **TWO** advantages and **TWO** limitations of applying liquid feed into irrigation water.

Half a mark awarded for each of the two advantages and two limitations.

The advantages of applying liquid feed into irrigation water was well understood

.Nutrients become readily available to meet the specific needs of plants at varying growing stages. This is a labour saving system and avoids wastage.

Limitations include the cost of the equipment, precise setting up and regular checking of equipment to ensure the correct dosage is being applied and nozzles are not being clogged up.

Q9 Explain how the time of the year affects the quality of natural light.

Two marks were awarded to candidates who gave a suitable explanation.

The importance of good light was appreciated by most candidates and how the seasons changed with special reference to protected crops. The harvesting period from sowing and planting to harvesting fluctuates with a change of season and available sunlight hours. Candidates generally were aware of the angle of the sun (60 degrees in summer compared with 20 degrees in winter) resulting in less shadow in summer and more light absorption. There is more water vapour/ clouds in the air in winter resulting in a reduction in light quality. The use of supplementary and replacement lighting to compensate for natural light was included in some answers

Q10 Describe **TWO** mechanical methods for removing conifers from the ground for root-balling.

Two mechanical methods were required, one mark for each. A number of candidates did not attempt this question.

Equipment which preserves a significant amount of root in the lifting operation helps to ensure less disturbance and slowing down of growth after lifting.

A machine tree spader will dig a uniform ball and lift the plant out of the ground, place in a burlap sock that holds the soil in position.

Tree spaders were the most frequently method described by candidates.

A tractor dragging an undercutting blade through the ground beneath the root was another method described.

A bed lift shaker system was also included by some candidates.

Reference was also made to highly specialised equipment for lifting mature specimens and indicated that some candidates were aware of the current trend in developing new sites rapidly.

Structured Questions

Section B – Outdoor Plant Production

Q11 Describe how mechanisation can be applied to **EACH** of the following aspects for **EITHER** top **OR** soft fruit production:

- i) ground preparation and tillage;
- ii) control of unwanted vegetation;
- iii) control of pests and diseases;
- iv) harvesting including transportation to storage.

This question was least popular with candidates, being answered by only 44% of them. Candidates gaining good marks in this question were those who were able to demonstrate that they had knowledge of fruit production and use of machinery arising from time spent in the industry. Regrettably many candidates lost marks because they lacked breadth of knowledge and understanding of the benefits of mechanisation. Some chose fruit crops that were poor exemplars of the use of machinery (e.g. strawberries) and could not show how machinery was used in commercial practice.

i) Ground preparation.

Few candidates showed in-depth knowledge of tillage equipment and how it is used to achieve the required conditions for growth of specific crops. Some candidates gained good marks by identifying post-planting cultivations

i) Control of vegetation.

This question had wide scope for a range of answers to get good marks. Candidates showed knowledge of controlling grass but could not relate it to row systems of fruit production. Few related mechanisation to pruning, topping or weed control.

iii) Control of pests and diseases.

As the range of mechanisation for this activity is limited candidates with knowledge could quickly gain good marks. However few candidates were able to give any details of types of spraying machinery available for different applications.

iv) Harvesting.

This section was not answered well. Few candidates could demonstrate knowledge of the range of mechanisation within the harvesting and marketing process. There were plenty of vague references to harvesting aids and transportation systems but little clear fact.

- Q12** a) Describe, using a **NAMED** example for **EACH**, how container plants grown for sale can be propagated by the following methods:
- i) seed;
 - ii) vegetative.
- b) Describe an annual routine maintenance plan required for container grown plants on the stock beds.
- c) Explain the importance of grading in the production of container grown plants for a **NAMED** market.

This question was tackled by 48% of candidates.

Most candidates showed good knowledge of propagation. Candidates gaining good marks in this question were those who could relate this to commercial scale production.

In the first part of the question concerned with propagation, most candidates showed they knew how to sow seeds, use growing media, containers and germination conditions and scored good marks for that. Few identified that commercially most seeds are sown mechanically into small cells or plugs or that most growers would use a generic “seed compost” rather than look in detail at how to make it. Most candidates gained marks by showing how the crop was grown on to be ready for selling although few stated at the outset what the finished product would be.

In part b most candidates gained marks by identifying the various activities that make up the care programme, but few gained full marks by relating it to commercial practice and its importance to the end product

In part c most candidates were able to identify the general requirements of grading e.g. for quality, size and growth stage but failed to score high marks by not relating it to the benefits of compliance to standards or customer specifications or the impact of failing to meet them.

Q13 Describe the production of **EITHER** a **NAMED** fruit, salad **OR** vegetable crop, to meet organic status under **EACH** of the following:

- i) management of the soil;
- ii) pest, disease and weed control.

Most candidates tackled this question (64%) and some scored very good marks. Candidates showed basic understanding of the principles of organic production.

The first part of the question asked the candidates to demonstrate how soil would be managed for crop production. Most showed they knew about green manures, rotations and cover crops but few could identify the inter-relationship between them, e.g. they stated that rotations were required and suggested “sowing a green manure prior to planting the crop” but failed to demonstrate how green manures and cover crops would fit into the rotation. Few candidates could explain the long-term management of soil within the organic system and the need for fertility and organic matter building.

Candidates were able to identify the principles of controlling P&D without chemicals. Candidates gained good marks for identifying the range of activities but again failed to look at long-term policies and the need for an integrated approach. Several candidates referred to monitoring and IPM, but failed to relate it to the range of activities within an organic system. Candidates could score good marks on weed control especially in vegetable crops but many missed the opportunity.

- Q14** a) Review the main factors to be considered when designing a packhouse for the handling of **EITHER** tree fruit, nursery stock **OR** vegetables.
- b) Identify the hazards associated with the operation of a packhouse.

This question was tackled by 52% of candidates. Some scored very good marks and could have achieved nearly full marks if they had completed the questions.

This question provided the experienced candidate and those who could apply principles to practical situations the opportunity to score high marks. Some candidates did this but others fared less well because they did not have a clear understanding of how crops are harvested, stored and marketed.

Most candidates gained reasonable marks for the first part of the question, some scored very high marks. Good marks went to the candidates who identified the facility, described how it should be designed and explained briefly the benefits. Some obvious one were often missed (e.g. welfare and health and safety considerations) and, surprisingly, cooling and storage facilities. Only one candidate described factors influencing storage. This was disappointing because it was five easy marks for anyone with any science knowledge.

The second part of the question asks candidates to "Identify hazards...." Some candidates scored good marks by spotting the standard hazards in any workplace and relating them to a packhouse (e.g. injury or death following contact with vehicles = being hit by a fork lift). But many spent a great deal of time describing in detail what precautions should be in place without identifying the hazard, therefore they did not get the marks.

Section C – Protected Plant Production

- Q15**
- a) State **FOUR** factors to be considered when choosing an irrigation system for protected cropping.
 - b) Describe, with the aid of clearly labelled diagrams, **THREE** methods of irrigating container grown plants in commercial production.
 - c) List **TWO** advantages and **TWO** limitations of **EACH** method named in b), when using this method of irrigation.

In part a) most candidates knew **FOUR** relevant factors to be considered in the selection of an irrigation system. Cost and suitability to particular cropping situations was regularly included in the answers provided. Some candidates chose more detailed reasons such as the speed of application or the system which conserved water best. It was refreshing to read the wide range of relevant factors provided by candidates.

In part b) diagrams were generally poor, drawings often small and few were well labelled. The descriptions were very brief with little or no detail relating to how the water was applied, the rate of application and what specific equipment was required. Some candidates confused mist propagation and methods of misting to raise relative humidities rather than describing irrigation systems. With the bulk of the marks awarded in this section more descriptive detail was required to attract maximum marks. Some candidates chose very similar methods to describe such as a traditional capillary irrigation and a flooded bench system. This created problems in showing significant differences between the way in which the water was applied and the equipment used.

In part c) advantages and limitations were well known with candidates providing good information about many of the irrigation systems described. Some candidates selected irrigation systems that were very similar. Candidates who selected the same fundamental method such as a traditional capillary irrigation bench and a flooded bench as part of their three irrigation methods found problems when they were asked to list the advantages and limitations of each method. Several candidates ruled out any form of liquid feeding through a capillary irrigation system.

Q16 Describe the production of a main season tomato crop under **EACH** of the following headings:

- i) growing system;
- ii) growing from seed to 'planting out';
- iii) trimming and training;
- iv) integrated pest management.

Some candidates misunderstood the first section of the question and described briefly the whole of the growing season including propagation, planting, support etc. Other candidates provided a very brief summary of the materials and method involved. Candidates lost marks through insufficient detail and poor descriptions.

The second section was answered poorly with insufficient detail. Details of sowing were very brief; very few provided details of actual temperatures for germination, method of sowing, propagation medium or required environmental conditions. Important points were not included about the process of pricking out and care after pricking out, watering and support were all either missing or very briefly mentioned.

Very few candidates described any commercially accepted methods of training main season tomato crops. The fundamental reasons for training were understood but many methods described related to the care of a very small numbers of tomato plants. Not all candidates included side shooting and de-leafing and some were confused as to the purpose of both these practical operations. Few candidates were able to describe the actual process involved and the significant points relating to their application to the crop.

Some candidates described methods of controlling pests in a tomato crop but did not relate this to an integrated approach. A few answered the question well combining chemical, biological and physical methods in their description of how they would control pest problems. Several candidates clearly understood the concept of targeting 'hot spots' where high concentrations of pest were present to establish a balance of control below the economic threshold for the crop.

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