



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

10:00am Wednesday 11th February 2009

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 **TWO** advantages and **TWO** limitations of sowing vegetable seeds in modules as compared with direct drilling.

2

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- Q2** List **FOUR** alternative outlets to supermarkets for the marketing of produce.

2

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- Q3** State the optimum stage for commercial harvesting for **ONE NAMED** crop for **EACH** of the following:

- i) top fruit;
- ii) soft fruit.

2

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- Q4** Explain the meaning of the term 'photoperiodism'.

2

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Please see over/.....

ANSWER ALL QUESTIONS

MARKS

Q5 State **FOUR** essential characteristics necessary in a greenhouse heating system.

2

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Q6 List **FOUR** environmental factors, which may be controlled, in the storage of cut flowers prior to marketing.

2

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Q7 Describe how a **NAMED** fungal disease can be prevented and/or controlled in a **NAMED** outdoor cut flower crop.

2

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Q8 State **TWO** advantages and **TWO** limitations of marketing bare-root shrubs rather than using containers.

2

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Please turn over/.....

ANSWER ALL QUESTIONS

MARKS

- Q9** State **FOUR** important factors to be considered when selecting a site for a tree and shrub nursery.

2

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- Q10** Explain the use of pheromone traps in top fruit growing and state **TWO** advantages of the method.

2

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10:00am Wednesday 11th February 2009

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
Q1	a) State the conditions required for a grower to qualify for organic status.	4
	b) Review the advantages and limitations to the grower of producing crops organically.	8
	c) Describe the range of pest, disease and weed control strategies available to the grower of organic crops.	8
Q2	a) State why risk assessments are an essential part of production horticulture.	4
	b) Write a risk assessment for the production of a NAMED outdoor cut flower crop from planting to harvest.	16
Q3	Explain how EACH of the following will affect the performance/growth of a crop:	
	i) uniformity of plant density;	4
	ii) irrigation;	4
	iii) cultivation;	4
	iv) fertilizer application;	4
	v) direct drilling.	4
Q4	Explain how EACH of the following will affect the growing and crop production of a NAMED top fruit:	
	i) selection of rootstock;	5
	ii) pollination and fertilization;	5
	iii) irrigation and nutrition;	5
	iv) pruning method.	5

Please see over/.....

Section C – Protected Plant Production

Answer ONE question only from this section

		MARKS
Q5	a) Compare the differences between biological control, cultural control and integrated pest management.	6
	b) Describe the use of integrated pest management for a stated pest on a NAMED salad crop grown under protection.	14
Q6	a) NAME FOUR different types of protective structures used for horticultural crops, describing in EACH case the construction and cladding materials used.	12
	b) Evaluate how shape, orientation and cladding materials will affect light transmission for TWO of the structures described in a).	8

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Wednesday 11th February 2009

MODULE D

Outdoor Plant Production Protected Plant Production

Candidates Registered	11		Total Candidates Passed	7	100.00%
Candidates Entered	7	63.64%	Passed with Commendation	6	85.71%
Candidates Absent	3	27.27%	Passed	1	14.29%
Candidates Deferred	1	9.09%	Failed	-	-
Candidates Withdrawn	-	-			

Section A – Short Answer Questions

- Q1** State **TWO** advantages and **TWO** limitations of sowing vegetable seeds in modules as compared with direct drilling.

Advantages – any two of the following, half a mark for each correct answer:

More reliable establishment,
More predictable timing of harvesting,
Higher yields
Limitations (any two),
More expensive,
Extra facilities required,
Require more time to plant.

Q2 List **FOUR** alternative outlets to supermarkets for the marketing of produce.

Any four of the following, half a mark for each correct answer:

Wholesale market,
Farm shops,
Pick your own,
Greengrocers,
Market stalls,
Direct to hotels and restaurants

Q3 State the optimum stage for commercial harvesting for **ONE NAMED** crop for **EACH** of the following:

- iii) top fruit;
- iv) soft fruit.

Half a mark for the correct naming of top fruit and soft fruit.
One and a half marks for stating the optimum stage of harvesting.

i) **Apple**

- The stage for harvesting has been identified by research – using ‘marker’ orchards by assessing fruit, firmness, colour, starch patterns and ethylene concentration.
- A more simple system is to observe change in colour, some windfalls and change in pip colour. Apples will require picking several times from an orchard.

ii) **Strawberries**

- Ideally the best time of day to harvest strawberries is in the morning when the berries are still cool to pick the complete fruit, try not to handle the flesh because they bruise easily.
- The harvesting period for outdoor strawberries lasts up to 3 weeks as the fruit do not all develop at once.
- The major extension of the strawberry season by growing under polythene requires the fruit to remain as cool as possible including the use of a cool store and the berries are picked slightly under ripe.

Q4 Explain the meaning of the term ‘photoperiodism’.

Two marks to be rewarded for an explanation which indicates that the candidate has an understanding of the term. Examples of plants and their classification would improve their answers.

‘The reaction of a plant to day length is called photoperiodism. It affects a number of the functions of the plant particularly flowering..

Examples of short day plants - Chrysanthemums

Long day plants - Petunias

Q5 State **FOUR** essential characteristics necessary in a greenhouse heating system.

Any four of the following, half a mark for each correct answer:

Correct size of boiler,
Standby facilities,
Safety,
Suitable fuel at the right price,
Competitive running costs,
Computerised control system.

Q6 List **FOUR** environmental factors, which may be controlled, in the storage of cut flowers prior to marketing.

Half a mark for each correct answer:

Temperature,
Water,
Light,
Avoid storing near fruit or other source of ethylene.
Carbon dioxide

Q7 Describe how a **NAMED** fungal disease can be prevented and/or controlled in a **NAMED** outdoor cut flower crop.

Half a mark for a correctly named fungal disease of cut flowers.

Half a mark for a correctly named outdoor cut flower.

One mark for prevention or control.

e.g. Hybrid Pinks – fungal disease stem and basal rot. – *Fusarium culmorum*.

A common cause of poor establishment, often enters the plant through wounds.

Prevention (propagation by cuttings) - Good hygiene, correct compost, only select good cutting material, avoid high humidities. If there is a delay in insertion the cuttings should be re-trimmed and inserted.

Q8 State **TWO** advantages and **TWO** limitations of marketing bare-root shrubs rather than using containers.

Half a mark for each correct answer.

Two advantages:

Lighter in weight
Lower transport costs
Does not require specialist potting equipment.

Limitations:

Shorter marketing period,
Less advanced growth,
Careful packaging – a risk of roots drying out,
Slower to establish.

Q9 State **FOUR** important factors to be considered when selecting a site for a tree and shrub nursery.

Half a mark for each correct answer.

Aspect – a southerly aspect will give an earlier increase in temperature,

Shelter – a site sheltered from strong winds - which may include shelter belts.

Soil – a well drained soil is essential.

Access to services - especially good roads,

Level ground – will help with a range of operations,

Soil type – although soil can be improved certain types will give an advantage.

Q10 Explain the use of pheromone traps in top fruit growing and state **TWO** advantages of the method.

1 mark for a basic explanation and two half marks for correct advantages.

- Pheromone traps are available and easy to assemble from flat packs. A small pheromone capsule is placed in the traps – attracts male moths which stick fast to the base of the trap. This reduces the number of females laying fertilised eggs and consequently reduces the number of caterpillar pests Advantages – relatively easy to apply.
- Reduces the need for insecticides to be applied with spray equipment.
Tried and tested for a range of pests including codling moths.

Structured Questions

Section B – Outdoor Plant Production

General Comments Questions 1 - 4

The quality of answers, were as expected, mixed. Some candidates were able to show clearly that they had a thorough knowledge of the subject, and were awarded marks accordingly. Other candidates misread questions and lost marks as a consequence. Drawings were often poorly executed and labelled when presented, answers in some cases were long-winded and inaccurate. The structuring of the written answer could be improved by some basic tutoring in this regard; some candidates failed to sub-divide by numbering or lettering their answers - bullet-pointing the key points and leaving a line between headings would help.

Q1 a) State the conditions required for a grower to qualify for organic status.

- Undergo a two-year conversion program
- Submit to annual inspections by, for example, the soil association
- Agree not to use GM crops
- Soil fertility maintained by using only approved organic techniques

Any 1 x 4

b) Review the advantages and limitations to the grower of producing crops organically.

Advantages

- GM-free food
- Premium prices for produce
- Perceived healthier food
- Reduction in environmental damage caused by pesticides
- Increase in local bio-diversity, insects birds, etc

Limitations

- Higher production costs
- High labour costs
- Time – lapse during conversion to organic
- Access for inspection by approving body
- Limited produce

Any 8 x 1

c) Describe the range of pest, disease and weed control strategies available to the grower of organic crops.

Cultural control methods such as maintaining soil conditions giving sturdier plants.

- Crop rotation
- Use of resistant cultivars
- Physical control such as traps and barriers
- Appropriate crop spacing

Any 2 x 4 Description of any 4 methods

Q2 a) State why risk assessments are an essential part of production horticulture.

- To assess any health risk to workforce and other personnel on and off the site, growers and marketers including transport
- To assess risk to the crop
- To minimise the impact of pesticides and fertilisers used to grow the crop on the environment
- Reduce chance of litigation
- Regular review of procedures to ensure on-going safety

Any 4 x 1

b) Write a risk assessment for the production of a **NAMED** outdoor cut flower crop from planting to harvest.

Answer to include an explanation for each of the following:

- Named crop outdoor cut flower crop e.g. dahlias/gladiolus
- Determination of hazard - to operative, cuts, slips and trips, back injury, allergic reaction to plant, at propagation, planting, disbudding and cutting, use of pesticides, injury from any mechanisation etc.
- Potential Harm - minor injury, major injury, death
- Risk Rating - low, medium, high
- Risk Reduction - Use of PPE, staff training, PA1 + PA6, use of pesticide alternatives etc

16 Marks

Q3 Explain how **EACH** of the following will affect the performance/growth of a crop:

- vi) uniformity of plant density;
- vii) irrigation;
- viii) cultivation;
- ix) fertilizer application;
- x) direct drilling.

- i) **Uniformity** - relate information to named crop(s), crop density affects yield, quality of crop, competition between plants and weeds, size of plants, harvesting dates **1 x 4**
- ii) **Irrigation** – timing of application, after planting, as fruits begin to swell, when SMD falls below critical level for specific crops- bring back to FC, use as folia feeding or as frost protection on tree fruits. **1 x 4**
- iii) **Cultivation** - timing-autumn late winter of cultivation, depth, tilth for specific crops, improves drainage and aeration, buries weeds, and incorporates organic matter improves soil structure. **1 x 4**
- iv) **Fertiliser application** - application rate according to soil sampling recommendations, plant nutrient ratio- NPK, and timing of application, high nitrogen for growth in spring, high potassium for improving flavour in late summer, relate to specific crops, liquid feeding v granular CRF types. **1 x 4**

- v) **Direct drilling** – affects on, cropping dates usually earlier, preparation of stale seedbed, allows for weed control at seedling stage of growth reduces competition, no disturbance to root system for some crops such as carrots and parsnips but thinning may affect others such as lettuce. The only method for most root crops- carrots parsnips etc

1 x 4

Q4

Explain how **EACH** of the following will affect the growing and crop production of a **NAMED** top fruit:

- v) selection of rootstock;
 - vi) pollination and fertilization;
 - vii) irrigation and nutrition;
 - viii) pruning method.
- i) Named rootstocks and vigour-M27, dwarfing, MM106, semi-dwarfing, influences type of tree, spindle cordon etc and how the vigour of the rootstock influenced the uniformity of the crop and yield. The earliness of cropping, reduction in suckering, and some disease resistance, also matching the soil type to cultivar and rootstock and how this influences the size of tree. **Any 1x5**
- ii) Pollination groups-time of flowering of named cultivars, compatibility factors-Cox related cultivars, diploids and triploids, frost damage to flowers and fruitlets-application of folia feeds help prevent frost damage to crop, fertilisation influenced by pollinators, temperature at which they fly. Also importance of receptive pistil and ripe pollen grains, pollen tube growth and prevailing weather conditions-rain washing pollen grains from stigma, complete and incomplete fertilisation and how this affects the development of the fruit. **Any 1x5**
- iii) Irrigation and nutrition, regular soil sampling and feeding rates and method of application, type of fertiliser, high nitrogen/high potassium and its timing, in periods of active growth, nutritional disorders such as Bitter Pit and its control. Applications of water, according to SMD, timing application of water at periods of active growth and after fruits begin to swell, use of water during forecast radiation frosts to prevent frost damage flowers and to fruitlets. **Any 1x5**
- iv) Pruning method summer pruning, timing of operation last week in July-first week in August, benefits = admittance of light and air therefore improves quality of fruit and may help to control some diseases such as Apple Canker and Powdery Mildew of apples by removing the infected shoots. Summer pruning also helps to control growth and promotes fruit-bud development.
Distinguish between regulated and renewal pruning-types of growth, bud-wood, growth-wood, dards, spurs, and tip-bearers recommended pruning method for specific tree types and cultivars. **Any 1x5**

Marks were awarded where other relevant information in addition to that outlined above was presented in candidate's answers.

Section C – Protected Plant Production

- Q5** a) Compare the differences between biological control, cultural control and integrated pest management.

The difference between these three terms was generally well understood however when it came to comparing the differences the answers were poor. There was also some confusion between what was meant by the terms biological and cultural control methods. Integrated pest management was less well known with candidates often becoming muddled over its relationship with the other two methods of control. It was not clearly known or understood that integrated pest management was the control of a pest by the use of integrating more than one method of pest control.

- b) Describe the use of integrated pest management for a stated pest on a **NAMED** salad crop grown under protection.

Timings, introduction techniques and methods of control were generally included in the answers to this question. There was a general lack of detailed facts however, with very general and vague terms used to describe many aspects of the process of control. For example the environmental conditions necessary for biological agents to work effectively. Other aspects of the answer were equally non committal including exact timings and stages of both the life cycle and the crop.

- Q6** a) **NAME FOUR** different types of protective structures used for horticultural crops, describing in **EACH** case the construction and cladding materials used.

Most candidates had little problem in naming four different types of protective structure. Some restricted themselves to glasshouse structures only, and then had difficulty in answering the second part of the question as the cladding and constructional materials were all much the same. A few candidates included shade halls and structures predominantly used for the protection from birds. Glasshouse construction was generally well known but the construction of tunnels, cold frames and cloches was generally less familiar.

- b) Evaluate how shape, orientation and cladding materials will affect light transmission for **TWO** of the structures described in a).

Few candidates had a full understanding of the importance of design and shape on maximising light entry and the reasons why. Very few mentioned the light integral and appreciated the importance of angles in the process of light entry. Eg High eaves maximising light entry during the winter period. Orientation was better understood however few candidates could explain why an E/W orientation improved light transmission compared to N/S. Knowledge of cladding materials in particular modern ones was very limited. Many explained the virtues of horticultural glass but acrylics and polycarbonates were often overlooked completely. Candidates who selected contrasting structures were able to focus on the differences between them more easily.

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