Candidate Number: ……

Candidate Name: ……

Centre Number/Name: ……

RHS (LEVEL 3) ADVANCED CERTIFICATE IN HORTICULTURE WRITTEN EXAMINATION

Tuesday 7th February 2006

IMPORTANT – Please read carefully before commencing.

i) The duration of the papers in Module **B** 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 **EITHER** metric **OR** imperial measurements, but **NOT** both.
vi) Where plant names are required, they should include genus, species and where appropriate, cultivar.

Module B

Plant Taxonomy, Morphology & Anatomy
Plant Physiology
Plant Health

Section A – Short Answer Questions

ANSWER ALL QUESTIONS

Marks

Q1 Name the characteristic features of the floral parts associated with the plant family Compositae, giving **TWO NAMED** examples. **2**

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Q2 State **FOUR** physiological reasons which cause plants to use more water in summer than in winter. **2**

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Q3 State **FOUR** essential design features required for a 'walk-in' chemical pesticide store. **2**

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Q4 Explain the differences between Epigeal and Hypogeal germination. **2**

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Please see over/……

ANSWER ALL QUESTIONS

Marks

Q5 State **FOUR** cultural treatments which could raise the photosynthetic efficiency of protected crops. **2**

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Q6 Explain the circumstances in which 'plant passports' and 'phytosanitary certificates' would be used. **2**

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Q7 State **FOUR** typical features of monocotyledonous plants. **2**

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Q8 State **FOUR** reasons for the development of resistance to pesticides. **2**

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Please turn over/……

ANSWER ALL QUESTIONS

Marks

Q9 State the effects of glasshouse ventilation on the rates of:

i) photosynthesis;
ii) transpiration. **2**

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Q10 State the function of the 'cork cambium'. **2**

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RHS (LEVEL 3) ADVANCED CERTIFICATE IN HORTICULTURE

WRITTEN EXAMINATION

Tuesday 7th February 2006

IMPORTANT – Please read carefully before commencing.

i) The duration of the papers in Module **B** is **2 hours**.
ii) Answer **ONE** question from each **B**, **C** and **D** Sections.
iii) **ALL** questions carry equal marks.
iv) Write your answers legibly in the answer booklets provided.
v) Use **EITHER** metric **OR** imperial measurements, but **NOT** both.
vi) Where plant names are required, they should include genus, species and where appropriate, cultivar.

Module B

Plant Taxonomy, Morphology & Anatomy
Plant Physiology
Plant Health

Sections B, C & D

Structured Questions

Please turn over/……

Section B – Plant Taxonomy, Morphology & Anatomy

Answer ONE question only from this section

			Marks
Q1	a)	Describe **FOUR** distinct methods by which plants are modified for climbing.	**8**
	b)	Give a **NAMED** plant example for **EACH** modification.	**4**
	c)	Explain the role and function of the vegetative parts specified.	**8**
Q2		Compare and contrast the anatomy and morphology of the leaves from monocotyledons and dicotyledons with reference to a **NAMED** example in **EACH** case.	**20**
		(Large clearly labelled diagrams should be used to illustrate the answer).	

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Please see over/……

Section C - Plant Physiology

Answer ONE question only from this section

			Marks
Q3	a)	Describe the role of chloroplasts in the process of photosynthesis.	**8**
	b)	Explain how the process of photosynthesis can be manipulated in **EACH** of the following:	
		i) propagation by seed and cuttings;	**4**
		ii) increasing food crop production under protective structures;	**4**
		iii) display of mature ornamental plants under glass.	**4**
Q4	a)	Describe **FOUR** tropisms which may affect the growth of plants.	**8**
	b)	Explain how the knowledge of tropisms can be of value in **EACH** of the following:	
		i) propagating plants;	**4**
		ii) harvesting and storing cut flowers;	**4**
		iii) using irrigation techniques.	**4**

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Section D – Plant Health

Answer ONE question only from this section

			Marks
Q5	a)	Describe the symptoms and probable causes for **EACH** of the following physiological plant disorders:	
		i) oedema;	**4**
		ii) bolting;	**4**
		iii) plant blindness.	**4**
	b)	Describe how a grower may avoid or alleviate **TWO** of the disorders listed in a).	**8**
Q6	a)	Describe the life cycle and typical damage caused to plants by **EACH** of the following pests:	
		i) glasshouse whitefly;	**6**
		ii) two spotted spider mite.	**6**
	b)	Describe a suitable pest management strategy for the control of **EACH**.	**8**

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RHS (LEVEL 3) ADVANCED CERTIFICATE IN HORTICULTURE
WRITTEN EXAMINATION

Tuesday 7th February 2006

Module B

Plant Taxonomy, Morphology & Anatomy
Plant Physiology
Plant Health

Examiners Report

Candidates Registered	372		Total Candidates Passed		
Candidates Entered	306	82.26%	Passed with Commendation	12	3.92%
Candidates Absent	39	10.48%	Passed	141	46.08%
Candidates Deferred	10	2.69%	Failed	153	50.00%
Candidates Withdrawn	17	4.57%			

Section A – Short Answer Questions

Q1 Name the characteristic features of the floral parts associated with the plant family Compositae, giving **TWO NAMED** examples.

Relatively few candidates gained full marks in this question. Candidates frequently neglected to refer to a compound flower head made up of many individual flowers mounted on a capitulum. Marks were given to those who referred to “ray and disc” florets and described them adequately. Too many candidates were unable to give accurately the names (genus and species) of two plant examples belonging to this family group.

Q2 State **FOUR** physiological reasons which cause plants to use more water in summer than in winter.

This question was generally answered satisfactorily by most candidates reflecting a good understanding of plant physiology and sound tuition. A number of candidates incorrectly referred to respiration as a reason and some wasted time on giving reasons why plants use less water in the winter which was not asked for. Most candidates gained full marks in this question.

Q3 State **FOUR** essential design features required for a 'walk-in' chemical pesticide store.

Most answers to this question reflected sound tuition and the marks awarded confirmed this. The answers required related to structural design features primarily. Those who failed to gain full marks gave answers related to operational or routine maintenance rather than essential design features. Essential design features included bunded walls/entrances, provision for good ventilation, frost protection features etc.

Q4 Explain the differences between Epigeal and Hypogeal germination.

Most candidates accurately related the differences between Epigeal and Hypogeal germination as relating to he relative positions of the seed leaves (cotyledons) after germination and seedling emergence. Full marks were frequently awarded for answers to this question. In cases where marks were not awarded this usually reflected confusion where candidates incorrectly referred to cotyledons remaining below the compost/soil surface for Epigeal and emerging above for Hypogeal germination. Some candidates incorrectly related the question to other unrelated plant processes.

Q5 State **FOUR** cultural treatments which could raise the photosynthetic efficiency of protected crops.

Candidates who failed to gain full marks were those who failed to describe a "cultural treatment" as required. For example a number of candidates simply stated "light" or "good light" without giving cultural treatment such as "washing down glass" to let in more light or providing supplementary lighting etc. Those gaining full marks referred to cultural treatments such as carbon dioxide enrichment, adequate nutrition to improve the quality (colour) of chlorophyll in leaves and regular irrigation to keep plant turgid and supply the water required for photosynthesis.

Q6 Explain the circumstances in which 'plant passports' and 'phytosanitary certificates' would be used.

Many candidates demonstrated a good knowledge of this subject area and gained marks for that. Marks were awarded to those who made the link with preventing the spread of quarantine pests and diseases even when they failed to explain the different uses of plant passports compared with phytosanitary certificates. Candidates gaining full marks were able to describe the issue of plant passports by registered production nurseries to accompany plant products for trade within the European Union (EU). Also they stated that phytosanitary certificates were issued by Plant Health and Seed inspectors of DEFRA to accompany plants distributed between UK and non EU states and vice versa.

Q7 State **FOUR** typical features of monocotyledonous plants.

Most candidates gained full marks for answers to this question indicating good botany tuition. Correct answers included references to floral parts in 3^s and multiples of 3; parallel veination; scattered vascular bundles; lack of secondary thickening, predominance of fibrous rather than tap roots; leaves with similar anatomical tissue structure arrangement on both sides of the leaf etc.

Q8 State **FOUR** reasons for the development of resistance to pesticides.

Most candidates correctly related the question to the development of insect pest; plant disease (pathogen) and weed population resistance to the repetitious use of associated pesticides; a phenomenon which horticulturists have been aware of for many years. Candidates generally answered this question well and gained marks by referring to the repetitious use of the same pesticide active ingredient; using pesticide programmes with active ingredients form the same general group of products; using too low a dosage rate; inadequate application (poor coverage) of the pesticide or using the product at the wrong life cycle stage of the pest etc. Some candidates failed to give reasons for the development of resistance and failed to gain full marks.

Q9 State the effects of glasshouse ventilation on the rates of:

i) photosynthesis;
ii) transpiration.

Most candidates failed to gain full marks for this question partly because they only referred to effects of open ventilators and neglected to refer to the effect of closed ventilators on the rates of photosynthesis and transpiration. Frequently candidates correctly indicated that fresh supplies of carbon dioxide are let in when ventilators are open but then failed to indicate what effect this would have on the rates of photosynthesis. Some candidates gained marks when they referred to temperature changes and then identified the effects this would have on the rates of both photosynthesis and transpiration.

Q10 State the function of the ‘cork cambium’.

Answers to this question were frequently incorrect or lacked sufficient information to gain full marks. Many candidates confused the function of the cork cambium with those of the products of the cork cambium. Candidates regularly and incorrectly stated that the cork cambium is a protective tissue when in effect it is meristematic and produces cork cells to its outer face, which in time become suberised and take on a protective role. To its inner face the cork cambium produces secondary cortex cell tissue. Marks also could not be given where candidates discussed secondary thickening or referred to the outer stem structure and neglected to state the function of the cork cambium as asked for.

Section B – Plant Taxonomy, Morphology & Anatomy

Q1 a) Describe **FOUR** distinct methods by which plants are modified for climbing.
b) Give a **NAMED** plant example for **EACH** modification.
c) Explain the role and function of the vegetative parts specified.

This question was answered by 74% of candidates and most performed well.
The great majority of students were able to describe four ways in which plants were modified for climbing and were able to give a named plant example in each case. There was much confusion between prickles (epidermal modifications) and thorns (stem or leaf modifications, not usually for climbing) and even some very inappropriate climbing examples e.g. Crataegus, Pyracantha. Also there was confusion between adventitious and aerial roots although credit was given where the latter was correct e.g. Monstera. Very few candidates really understood that the tendrils ending in adhesive pads of Parthenocissus were modified stems. The description of this plant often implied that students had never examined Parthenocissus in any detail. Sometimes Tropaeolum was used as an example of twining petioles but many thought that the correct scientific name of this plant was Nasturtium sp.
The third part of the question expected responses concerning the competitive advantage of the climbing habit and greater detail on the climbing mechanisms of adventitious roots, twining structures and prickles. Many of these responses were given by candidates and were not always in this part of the question, although marks were given, in this instance, wherever the correct response was given. Thigmotropism was often confused with thigmonasty, phototropism etc or spelt incorrectly.

Q2 Compare and contrast the anatomy and morphology of the leaves from monocotyledons and dicotyledons with reference to a **NAMED** example in **EACH** case.

(Large clearly labelled diagrams should be used to illustrate the answer).

This question was answered by 26% of candidates and n general was not very well done.
There was much uncertainty in the answers to this question but better performances could have been expected if a more logical approach to the answering of the question had been adopted. In essence, candidates should have brought out the similarities in the morphology and anatomy of Monocotyledon and Dicotyledon leaves and then brought out the differences or vice versa. Most answers concentrated on the differences and often ignored similarities. Similarly, several answers concentrated on either the morphology or the anatomy and ignored the other.
Most difficulty experienced with the morphology of the leaves. Reticulate and parallel venations were mentioned by almost all but the presence or absence of a midrib, of a petiole and of a sheathing base to the leaf were usually omitted. Both types of leaf have a flat blade or lamina and an axillary bud in the axil although these were hardly referred to in answers.

Concerning the anatomy of the two sorts of leaf, the distribution of stomata and the presence or absence of palisade mesophyll were usually known but the possibly differing distribution of sclerenchyma was not. As mentioned before, the tissues held in common by the two sorts of leaves e.g. epidermis, mesophyll, xylem and phloem were not usually brought out in answers.
Diagrams were extremely poor. Simple tissue distribution diagrams without detail of cells were expected but the standard of drawing left a lot to be desired. If individual cells are to be drawn the convention is to draw in the cell walls but no other detail. Often cell walls showed the presence of chloroplasts! Many diagrams were sketchy and did not show the anatomy at all clearly. The drawing of the Monocotyledon was often omitted.
The question expected one named example of each type of plant in the answers and it was surprising how difficult this appeared to be for many candidates. The type of example chosen e.g. marram grass, Poa annua, Fagus sylvatica was strangely restricted when it is borne in mind how many different plants of the two types must have been encountered during the course of student studies.

Section C - Plant Physiology

Q3 a) Describe the role of chloroplasts in the process of photosynthesis.
b) Explain how the process of photosynthesis can be manipulated in **EACH** of the following:
i) propagation by seed and cuttings;
ii) increasing food crop production under protective structures;
iii) display of mature ornamental plants under glass.

a) Candidates who provided detailed information on the <u>role</u> of the chloroplasts gained higher marks. Many candidates failed to gain marks as they spent much time describing the <u>structure</u> of chloroplasts, which was not requested.

b) i) Candidates gaining highest marks were those who gave details of:
a) Length of light in a 24 hour period
b) Light quality - wavelengths
c) CO_2 enrichment

ii) Candidates gaining highest marks were those who gave details of:
a) CO_2 enrichment/timing of CO_2 enrichment
b) Issues relating to the cost of providing lights for this situation – not economical in most food crop situations
c) Providing irrigation to relate to the demands of the crop i.e. plant response periods

iii) The examiner was looking for:
a) The quality and intensity of the lights to be used
b) The <u>duration</u> of light within a 24 hour period in order to avoid light compensation problems
c) The cost/efficiency of providing CO_2 enrichment for mature plants.

Q4 a) Describe **FOUR** tropisms which may affect the growth of plants.
b) Explain how the knowledge of tropisms can be of value in **EACH** of the following:

i) propagating plants;
ii) harvesting and storing cut flowers;
iii) using irrigation techniques.

a) A good understanding was shown by many candidates of how tropisms can affect plant growth. Candidates who described how tropisms affect plant growth in different environments gained higher marks e.g. poor light, water source.

b) i) Candidates who could inter-relate light, temperature and water gained higher marks. Very general answers were recorded which did not relate to the requirements of plant propagation.

ii) Good answers were recorded on the role of water, temperature and light in the harvesting and storage of cut flowers. Candidate answers concentrated on the storage of cut flowers. The environmental conditions necessary for harvesting of cut flowers was not covered by the majority of candidates. Answers should have included:

- ∞ Water levels within the plant to be optimum
- ∞ Light levels to be long in duration within the 24 hour period to ensure flower opening
- ∞ Temperature to be described in relation to light and the development of the flower

iii) The majority of candidates presented good answers. The actual position of water entry in order to encourage root hair development was required. The relationship of gravity and water in respect to:

I. The growth of the main root structure
II. The influence of water to the development (and therefore growth direction of root) of the root hairs.

Section D – Plant Health

Q5 a) Describe the symptoms and probable causes for **EACH** of the following physiological plant disorders:

i) oedema;
ii) bolting;
iii) plant blindness.

b) Describe how a grower may avoid or alleviate **TWO** of the disorders listed in a).

a) The symptoms of oedema, bolting and plant blindness were mostly accurately recorded. In order to achieve higher marks candidates were required to elaborate about possible causes of these disorders, including susceptible plants, the influence of environmental and climatic conditions, plant nutrition and the effect of pest and diseases.

b) Higher marks were awarded to candidates who not only identified methods of alleviating these disorders but also demonstrated their knowledge with practical working solutions.

Q6 a) Describe the life cycle and typical damage caused to plants by **EACH** of the following pests:

i) glasshouse whitefly;
ii) two spotted spider mite.

b) Describe a suitable pest management strategy for the control of **EACH**.

a) Glasshouse whitefly and two-spotted spider mite life cycles were mostly well described. In order to achieve higher marks references also needed to be made to the life cycle duration and seasonality, typical host plants and damaging phase.

b) Better candidates were able to write about practical control methods, including pest monitoring, when and where to introduce biological controls, name approved pesticides and describe how they are integrated into a pest management system.

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