Candidate Number: ……

Candidate Name: ……

Centre Number/Name: ……..

RHS (LEVEL 3) DIPLOMA IN HORTICULTURE
WRITTEN EXAMINATION

Thursday 7th July 2005

IMPORTANT – Please read carefully before commencing.

i) The duration of the papers in Module **G** 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.

Module G

Genetics and Plant Breeding, Systematic Botany Physiology of Flowering, Reproduction and Development

Section A – Short Answer Questions

Please turn over/……

ANSWER ALL QUESTIONS

MARKS

Q1 Define the term 'genetic contamination' in relation to genetically modified crops. **2**

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Q2 Name **TWO** factors that can change the structure of Deoxyribonucleic Acid (DNA). **2**

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Q3 List **FOUR** horticultural uses for plants in the family Brassicacae providing a **NAMED** example in **EACH** case. **2**

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Q4

a) State how plants may be classified according to day-length response. **2**

b) Define **ONE** of these groups together with a **NAMED** plant example.

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Please see over/…..

ANSWER ALL QUESTIONS

Q5 Define the term 'apomixis' providing a **NAMED** example. **2**

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Q6 Describe the effect of temperature on flower initiation of a **NAMED** plant. **2**

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Q7 Describe the process of 'after ripening' for the seed of a **NAMED** plant. **2**

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Q8 Distinguish between actinomorphic and zygomorphic flowers providing a **NAMED** example of **EACH**. **2**

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Please turn over/…..

ANSWER ALL QUESTIONS

Q9 Define the term phyllotaxy, providing **TWO** distinct plant examples. **2**

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Q10 Define the term ‘chiasmata’ and describe the part of the plant in which this occurs. **2**

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RHS (LEVEL 3) DIPLOMA IN HORTICULTURE
WRITTEN EXAMINATION

Thursday 7th July 2005

IMPORTANT – Please read carefully before commencing.

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

Module G

Genetics and Plant Breeding, Systematic Botany
Physiology of Flowering, Reproduction and Development

Sections B & C

Structured Questions

Please turn over/……

Section B – Genetics and Plant Breeding, Systematic Botany

Answer ONE question only from this section

			MARKS
Q1	a)	State how Deoxyribonucleic Acid (DNA) controls protein synthesis in the plant cell.	**8**
	b)	Describe **TWO** practical methods of inducing mutation in plants, providing a **NAMED** plant example of horticultural benefit for **EACH**.	**12**
Q2	a)	Compare and contrast the botanical characteristics of **TWO NAMED** plant families with the aid of floral formulae and floral diagrams.	**10**
	b)	Explain the use of a dichotomous key to distinguish between genera of **ONE** of the families named in a).	**4**
	c)	Evaluate **TWO** horticultural genera in b), with reference to a **NAMED** species in **EACH** genus.	**6**

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Please see over/…….

Section C – Physiology of Flowering, Reproduction & Development

Answer TWO questions from this section

MARKS

Q3 a) Define the term 'plant growth regulator' (PGR). **4**

b) List the main classes of PGR's and describe their principal activity within the plant. **8**

c) Describe how **TWO** of the plant growth regulators listed in b) may be used in commercial crop production, giving **ONE NAMED** plant example in each case. **8**

Q4 a) Define **EACH** of the following **THREE** common types of seed dormancy:

i) innate;
ii) induced;
iii) enforced. **10**

b) Describe **ONE** method of breaking dormancy for **EACH** of the types defined in a) and give a **NAMED** example in each case. **10**

Q5 a) Define physiological age. **4**

b) Describe how it may influence flowering. **8**

c) Describe **TWO** methods used to overcome the effects of juvenility in commercial production of **TWO NAMED** plants. **8**

Q6 a) Discuss how environmental factors influence the shelf life of fresh fruit and vegetables. **8**

b) Describe how these factors may be controlled to maximise shelf life of **NAMED** examples of fresh fruit and vegetables. **12**

RHS (LEVEL 3) DIPLOMA IN HORTICULTURE

Thursday 7th July 2005

MODULE G

Genetics and Plant Breeding, Systematic Botany Physiology of Flowering, Reproduction and Development

Examiners Comments

Candidates Registered	43		Total Candidates Passed		
Candidates Entered	36	83.72%	Passed with Commendation	4	11.11%
Candidates Absent	6	13.95%	Passed	19	52.78%
Candidates Deferred	1	2.33%	Failed	13	36.11%
Candidates Withdrawn	0				

Section A. Short Answer Questions

Q1. Define the term 'genetic contamination' in relation to genetically modified crops.

This question was not well answered. Higher marks were awarded to candidates who discussed genetic drift in the context of GM crops.

*Q2. Name **TWO** factors that can change the structure of Deoxyribonucleic Acid (DNA).*

This question was not well answered. Marks could not be awarded where candidates quoted the results of mutations and not the factors which cause mutation in the first place.

*Q3. List **FOUR** horticultural uses for plants in the family Brassicacae **providing** a **NAMED** example in **EACH** case.*

This question was adequately answered. Marks could be awarded *when* quoting full Latin names and where Brassicaceae examples were used, typically *Lactuca sativa* which is *Asteraceae*. Higher marks were awarded for different horticultural uses with plants correctly named.

Q4 a) *State how plants may be classified according to day-length response.*
b) *Define **ONE** of these groups together with a **NAMED** plant example.*

This question was adequately answered. *However some* candidates failed to link the classification to the response to photoperiod. Section b) was well answered. High marks were awarded for a clear definition of a group and named example.

*Q5. Define the term 'apomixis' providing a **NAMED** example.*

This question was poorly answered. Answers demonstrated a lack of understanding of the term. It is used to describe the process of reproducing without the fusion of gametes (asexually).

*Q6. Describe the effect of temperature on flower initiation of a **NAMED** plant.*

This question was adequately answered. Higher marks were awarded for an appropriate example and a clear description of the process of vernalisation

*Q7. Describe the process of 'after ripening' for the seed of a **NAMED** plant.*

This question was poorly answered. Answers demonstrated a lack of understanding of the term, and in some cases marks could not be awarded because of citing inappropriate examples.

*Q8. Distinguish between actinomorphic and zygomorphic flowers providing a **NAMED** example of **EACH.***

This question was adequately answered with higher marks being awarded for a clear distinction between the two floral types and appropriate examples.

*Q9. Define the term phyllotaxy, providing **TWO** distinct plant examples.*

This question was poorly answer due to many candidates demonstrating a lack of understanding of the term. High marks were awarded to candidates who defined the term in the context of the arrangement of leaves on the stem.

Q10. Define the term 'chiasmata' and describe the part of the plant in which this occurs.

This question was well answered with high marks being awarded for a precise definition. Candidates should clearly state where in the plant this occurs.

Section B. Structured Questions (Genetics and Plant Breeding, Systematic Botany)

Q1. *a)* *State how Deoxyribonucleic Acid (DNA) controls protein synthesis in the plant cell.*

b) *Describe **TWO** practical methods of inducing mutation in plants, providing a **NAMED** plant example of horticultural benefit for **EACH**.*

a) This part of the question was adequately answered. High marks were awarded for a clear presentation of the various stages in protein synthesis, including a consideration of the role of MRNA, TRNA, the triplet codons, the ribosomes and the final formation of polypeptides.

b) This question was poorly answered. *Candidates could not be* awarded *marks* for *providing* examples of genetic modifications *and poorer candidates failed to cite* appropriate horticultural examples. High marks were awarded for descriptions of the use of X rays and mutagenic chemicals to induce mutation and appropriate horticultural examples.

Q2. *a)* *Compare and contrast the botanical characteristics of **TWO NAMED** plant families with the aid of floral formulae and floral diagrams.*

b) *Explain the use of a dichotomous key to distinguish between genera of **ONE** of the families named in a).*

c) *Evaluate **TWO** horticultural genera in b, with reference to a **NAMED** species in **EACH** genus.*

a) This section was adequately answered. High marks were awarded for clear, precise floral diagrams, accurate floral formulae and correct spelling of plant names. Marks could not be awarded when candidates omitted to compare and contrast the plant families.

b) This section was poorly answered. Marks could not be gained *when* candidates omitted to explain the use of a key in relation to ONE of the families named in a).

c) This section was adequately answered with higher marks *being* awarded for detailed evaluations of 2 different horticultural genera. *Better* candidates were able to provide appropriate selections and spelling of plant names. Marks were lost for citing Genera in different families.

Section C. Structured Questions (Physiology of Flowering, Reproduction & Development).

Q3. *a) Define the term 'plant growth regulator' (PRG).*
b) List the main classes of PRG's and describe their principal activity within the plant.
*c) Describe how **TWO** of the plant growth regulators listed in b) may be used in commercial crop production, giving **ONE NAMED** plant example in each case.*

a) The best definitions made a clear distinction between PRGs, endogenous and synthetic growth regulators.

b) Most candidates identified the five main classes of PGRs. The principal activity of auxins/IAA, gibberellins and ethene/ethylene were generally well described, but there was less clarity or knowledge of cytokinins and abscisic acid. The interaction between PGRs was not required nor was discussion about the variety of effects under different circumstances.

c) The use of auxin/IAA in promoting root initiation was the most popular choice, closely followed by the use of cytokinins in micropropagation . Some candidates choose to describe the use of ethene/ethylene mainly in the promotion of flowering in bromeliads or bulbs. There were some examples of the role of anti-gibberellins and anti-ethene in commercial use. Many could not be awarded marks because named examples were not given or were inappropriate.

Q4. *a) Define **EACH** of the following **THREE** common types of seed dormancy:*
i) innate;
ii) induced;
i) enforced.

*b) Describe **ONE** method of breaking dormancy for **EACH** of the types defined in a) and give a **NAMED** example in each case.*

a) Enforced and innate dormancy were generally well defined, but there was frequent confusion between induced dormancy and the other often by not being clear that this dormancy is as a result of a physiological condition brought about after the seed is shed.

b) Most candidates gave examples of enforced dormancy, commonly lettuce citing the need for light as well as water, suitable temperature and oxygen. There was a wide range of methods used to break innate dormancy in the answers from successful candidates, but it was disappointing to find many needed to quote agricultural rather than horticultural crops. Very few gave named examples of methods to break induced dormancy.

Q5. *a) Define physiological age.*
b) Describe how it may influence flowering.
*c) Describe **TWO** methods used to overcome the effects of juvenility in commercial production of **TWO NAMED** plants.*

a) Most answers defined physiological age in terms of juvenility. The best answers included reference to the number of leaves and leaf primordia.

b) Those who had used a definition including the importance of leaf number and/or leaf primordial scored more highly in relating physiological age to flowering. Good answers made reference to 'ripe-to-respond' or the 'competent' state.

c) Most successful answers addressed curtailing extended juvenility in fruit or forest trees by grafting. A few answers mentioned tissue culture or root pruning but often without giving named plants.

Q6. *a) Discuss how environmental factors influence the shelf life of fresh fruit and vegetables.*
*b) Describe how these factors may be controlled to maximise shelf life of **NAMED** examples of fresh fruit and vegetables.*

a) This was well answered by most candidates attempting the question and the best answers were clear about the environmental effects on respiration and desiccation, air velocity and they discussed climacteric fruits. Disappointingly, agricultural/plantation plants were often given in preference to UK horticultural plants.

b) Most candidates scored well and the highest marks went to those who included humidifiers, vacuum coolers, controlled atmosphere stores, shrink wrapping, modified atmosphere packaging with an indication of oxygen levels achieved.

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