



R2101

PLANT CLASSIFICATION, STRUCTURE AND FUNCTION

Level 2

Monday 13 February 2012

9.30 – 10.30

Written Examination

Candidate Number:

Candidate Name:

Centre Number/Name:

IMPORTANT – Please read carefully before commencing:

- i) The duration of this paper is **60 minutes**.
- ii) **ALL** questions should be attempted.
- iii) **EACH** question carries **10 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.
- vii) Please note, sufficient lined space is provided. It is **not** necessary that all lined space is used when answering a question.

ANSWER ALL QUESTIONS

MARKS

Q1

State the function of **EACH** of the following plant cell components by completing the table below.

Cell Component	Function	
Mitochondrion		2
Vacuole		2
Nucleus		2
Cell wall		2
Cytoplasm		2
		Total Mark

Please see over/.....

Q2 a) Define **EACH** of the following terms:

- i) tap root;
- ii) fibrous root;
- iii) adventitious root.

3

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b) With the aid of a clearly labelled diagram, illustrate the internal structure of a young dicotyledonous root.

7

Total Mark

Please turn over/.....

2
1

- 7

4

Q4 a) List **FOUR** stages of the plant life cycle.

2

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b) Define **EACH** of the following terms and give **TWO** distinct **NAMED** plant examples for each, by completing the table below.

8

Term	Definition	Plant examples
Half-hardy annual		1
		2
Hardy annual		1
		2

Total Mark

Please turn over/.....

Q5 a) Name the plant organ where most photosynthesis occurs.

1

.....

b) Name **FOUR** necessities for the process of photosynthesis.

1

.....

.....

.....

.....

Name **TWO** products of photosynthesis.

2

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c) Describe how the levels of the following factors influence the rate of photosynthesis:

- i) temperature;
- ii) mineral nutrients.

6

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Total Mark

Please see over/.....

Q6 a) State **TWO** functions of the fruit in plant reproduction.

2

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.....

b) Label **EACH** of the following features on the diagram below (Fig 1):

- i) scutellum/cotyledon;
- ii) plumule;
- iii) aleurone layer;
- iv) endosperm;
- v) radicle;
- vi) coleoptile.

6

L.S. *Zea mays* seed

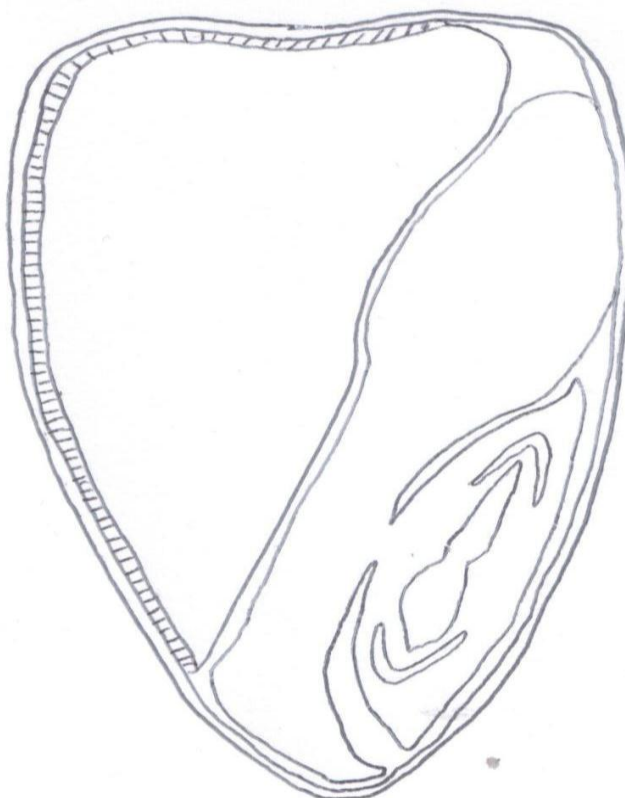


Fig 1 (Not to scale)

c) Identify **TWO** differences between seeds of *Zea mays* (maize) and *Vicia faba* (broad bean).

2

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Total Mark

Please turn over/.....

Q7 a) State how plant cells cause an increase in plant size.

1

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b) Describe **THREE** ways in which plant growth is affected by competition for **EACH** of the following factors:

- i) water;
- ii) light;
- iii) space.

3

3

3

[illegible]

Total Mark

1

Please see over/.....

Q8 a) Name **TWO** external features of a woody stem.

1

.....

.....

.....

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b) Identify **THREE** distinct functions of stem adaptations. Give a **NAMED** stem adaptation and plant example for **EACH** function by completing the table below.

Function of stem adaptation	Name of stem adaptation	Plant example

3

3

3

Total Mark

Please turn over/.....

Describe what is meant by **EACH** of the following terms used in plant classification. Give a different **NAMED** plant example for each term:

- 3
4
3

11

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Charity Registration Number: 222879/SC038262**

R2101

PLANT CLASSIFICATION, STRUCTURE AND FUNCTION

Level 2

Monday 13 February 2012

Candidates Registered	1126	Pass with Commendation	152 (15.95%)
Candidates Entered	953	Pass	409 (42.92%)
Absent/Withdrawn/Deferred	173	Fail	392 (41.13%)
Total Candidates Passed	561 (58.87%)		

Senior Examiner's Comments:

1. Candidates should be able to demonstrate a good range of plant knowledge and be able to give accurately named plant examples where appropriate. Common names and generic names are often too vague and cannot be rewarded in the positive manner that genus, species and where appropriate, variety/cultivar can. This is particularly important when answering questions relating to particular (named) plant(s). Marks can only be awarded for these narratives where the example(s) are correctly and fully identified.
2. Candidates must be able to display accurate knowledge of the technical terms and concepts detailed in the syllabus, in the context of horticulture and be aware that wider interpretation will not be rewarded. The examination should be regarded as a possible introduction to higher level studies, which will only be open to those who are in possession of a clear understanding of the horticultural terms and concepts which are current.
3. The introductory rubric given on the first page of each question paper should be read carefully by candidates. At each examination there are a significant number of candidates who ignore or misread the instructions given and consequently may not perform as well as they could have done
4. Candidates should pace themselves during each paper. The most successful candidates allow sufficient time to read the question thoroughly before answering it and also take time to read through their answers. They should take care to write as legibly as possible, so that the examiner is in no doubt about what is intended.
5. Candidates need to interpret key words within questions, particularly those such as 'state', 'list' and 'describe'. Questions requiring descriptions or explanations obviously require a more detailed answer than those requiring a list.
6. It is important to ensure that responses to questions are to the point. Candidates should bear in mind that small sketches might be used to convey information more succinctly than words.

7. Successful candidates ensure that their answers are focused and to the point. It is disappointing when they cannot be rewarded for their efforts because the answer is irrelevant to the particular question. Candidates should take note of the mark allocation for specific sections and allocate their time and efforts accordingly.
8. Diagrams can enhance an answer and where appropriate can replace detailed descriptions. They should be large, clear and well annotated, ensuring that labels are properly attached to the features they describe. Diagrams should preferably be in pencil. Colour may be used successfully but only where it is relevant to the answer.
9. In each examination it is clear that some candidates are ill prepared to answer papers of the type set. It is essential that candidates have the opportunity to practice questions. Ideally some papers should be answered in a time constrained situation. Appropriate feedback must, in any case be provided
10. Candidates should be aware of the reading list of suggested books for the RHS Level 2 Certificate in The Principles of Plant Growth, Propagation and Development which is available from the Qualifications Section and can also be found on the RHS website together with past papers.

Examiners' Comments:

- Q1** *State the function of **EACH** of the following plant cell components by completing the table below.*
- Marks**

Cell Component	Function	
<i>Mitochondrion</i>		2
<i>Vacuole</i>		2
<i>Nucleus</i>		2
<i>Cell wall</i>		2
<i>Cytoplasm</i>		2

Candidates who qualified their answers gained the best marks; e.g. mitochondria performing respiration to release energy, vacuole controls cell turgor and contains pigments, nucleus contains genetic information and controls cell processes, cell wall controls the shape of the cell and supports the cell and cytoplasm surrounds the cell contents and enables substances to be transported within the cell.

Those candidates whose answers were more descriptive and therefore did not state the function clearly could not be awarded full marks.

Q2 a) Define **EACH** of the following terms:

- i) tap root;
- ii) fibrous root;
- iii) adventitious root.

3

b) With the aid of a clearly labelled diagram, illustrate the internal structure of a young dicotyledonous root.

7

a) Full marks were awarded to those candidates who correctly defined each of the types of root. Details of their function were not required. Acceptable answers included; a tap root is the main or primary root, fibrous root has many roots branching from the base of the stem and adventitious roots grow on other plant parts.

b) Candidates who provided good drawings with clear labelling were able to gain high marks for this section of the question. Maximum marks were awarded to those candidates who correctly labelled seven parts of a young dicotyledonous root e.g. epidermis, cortex, phloem, cambium, xylem, root hair, root tip etc. Some candidates provided a longitudinal section of a root where it was more difficult to gain high marks.

Q3 a) State what is meant by **EACH** of the following terms:

- i) gamete;
- ii) zygote.

2

1

b) Describe the process of fertilisation in a flowering plant.

7

a) The majority of candidates understood that a gamete is a sex cell and can be male or female and that a zygote is the fusion of the gametes and were able to gain full marks for this section of the question.

b) The best candidates provided a good description of the process of fertilisation in a flowering plant and included details of the pollen grain containing two nuclei, one being the tube nucleus which forms the pollen tube and grows down the style, the generative nucleus dividing to form two male gametes and the male gametes entering the ovule through the micropyle to unite with the female gamete.

Q4 a) List **FOUR** stages of the plant life cycle.

2

- b) Define **EACH** of the following terms and give **TWO** distinct **NAMED** plant examples for each, by completing the table below.

8

Term	Definition	Plant examples
Half-hardy annual		1 2
Hardy annual		1 2

- a) Most candidates were able to list four stages of the plant life cycle and included; seed, juvenile, adult, senescence or death. Pollination and fertilisation were not acceptable.

- b) The majority of candidates correctly defined both types of annuals as completing their life cycles in one year but became confused with the fact that a half hardy annual does not tolerate frost whereas a hardy annual is not damaged by frost.

Candidates who gained full marks for this section of the question followed the rubric for the examination paper and gave full botanical names for plant examples e.g. *Helianthus annuus*, *Lathyrus odoratus* or *Nigella damascena* as hardy annuals and *Petunia hybrida*, *Lobelia erinus* or *Tagetes patula* as half hardy annuals.

Many candidates lost marks in this section of the question through poor plant knowledge.

- Q5** a) Name the plant organ where most photosynthesis occurs **1**
- b) Name **FOUR** necessities for the process of photosynthesis. **1**
- Name **TWO** products of photosynthesis **2**
- c) Describe how the levels of the following factors influence the rate of photosynthesis:
- i) temperature;
- ii) mineral nutrients. **6**

- a) The majority of candidates named the leaf as the plant organ where most photosynthesis occurs and were awarded the mark.

- b) Candidates were required to name all four necessities for the process of photosynthesis to gain the full mark; i.e. chlorophyll, light, carbon dioxide and warmth.

The majority of candidates were able to name two products of photosynthesis e.g. oxygen, sugar, glucose or carbohydrate and were awarded full marks.

- c)i) The best candidates identified the key word in the question as being the 'rate' of photosynthesis and correctly described how an increase in temperature increases the rate of photosynthesis and how at very high temperatures photosynthesis stops as the stomata close to reduce water loss.
- c)ii) Many candidates understood that minerals influence the rate of photosynthesis but failed to provide details explaining how some minerals are involved in the production of chlorophyll e.g. iron and manganese and that magnesium is a constituent of chlorophyll.

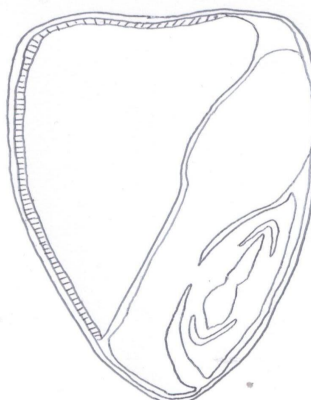
Q6 a) State **TWO** functions of the fruit in plant reproduction. **2**

b) Label **EACH** of the following features on the diagram below (Fig 1):

- i) scutellum/cotyledon;
- ii) plumule;
- iii) aleurone layer;
- iv) endosperm;
- v) radicle;
- vi) coleoptile.

6

L.S. *Zea mays* seed



c) Identify **TWO** differences between seeds of *Zea mays* (maize) and *Vicia faba* (broad bean). **2**

- a) The best answers were from those candidates who qualified their answers e.g. stating that a fruit protects the seed from damage or weather or that it contributes to dormancy by delaying germination until conditions are favourable.
- b) To gain maximum points candidates needed to draw lines to precise points on the diagram when labelling the diagram of the *Zea mays* and not in a general area to show their knowledge of the anatomy of the seed.

- c) The better candidates were able to identify specific differences between seeds of *Zea mays* and *Vicia faba*. *Vicia faba* has two cotyledon leaves whereas *Zea mays* has one, it has a food store whereas *Zea mays* has an endosperm. *Vicia faba* has no aleurone layer or coleoptile and it is a true seed whereas *Zea mays* is a fruit.

Q7 a) State how plant cells cause an increase in plant size. **1**

- b) Describe **THREE** ways in which plant growth is affected by competition for **EACH** of the following factors:

- | | | |
|------|--------|----------|
| i) | water; | 3 |
| ii) | light; | 3 |
| iii) | space. | 3 |

- a) The majority of candidates correctly stated that plant cells cause an increase in plant size by expansion, elongation and cell division.
- b) Candidates who gained high marks for this section of the question linked their answers to the key word competition. Acceptable answers for water included stunted growth, wilting, reduced leaf area etc. for light they were; etiolated or spindly growth, lack of chlorophyll and prolonged juvenile growth and for space suitable answers included; distorted growth, seedling death and elongated growth of trees.

Q8 a) Name **TWO** external features of a woody stem. **1**

- b) Identify **THREE** distinct functions of stem adaptations. Give a **NAMED** stem adaptation and plant example for **EACH** function by completing the table below.

Function of stem adaptation	Name of stem adaptation	Plant example	
			3
			3
			3

- a) Candidates who were able to name the external features of a woody stem e.g. node, internode, lenticel, bark and leaf scar gained maximum marks. Some candidates read too much into the question and named processes which could not be awarded marks.

- b) The best candidates were able to provide specific functions of correctly named stem adaptations (instead of leaf adaptations) and provide a suitable plant example. Good examples included; climbing towards the light for photosynthesis by the use of a tendril of a *Vitis vinifera* or storage for perennation by a stem tuber of a *Solanum tuberosum*. Full botanical names of plants were required for full marks.

Q9 a) State what is meant by **EACH** of the following terms:

- | | | |
|-----|------------|----------|
| i) | diffusion; | 2 |
| ii) | osmosis. | 2 |

- b) Describe **ONE** role within the plant for **EACH** of the processes listed in a). **6**

- a) Full marks were awarded to candidates who stated clearly the meaning of the terms diffusion and osmosis i.e. diffusion is the movement of a substance from a higher concentration to a lower concentration by random thermal agitation and osmosis is the movement of water across a semi-permeable membrane from a high water concentration to a low water concentration.
- b) Candidates were able to describe a range of roles within the plant for both diffusion and osmosis. One role for diffusion is the movement of dissolved gases for photosynthesis across leaf cells e.g. in and out of chloroplasts where there is diffusion of carbon dioxide and oxygen. One role for osmosis is water uptake from the soil by root cells and root hairs.

Q10 Describe what is meant by **EACH** of the following terms used in plant classification. Give a different **NAMED** plant example for each term:

- | | | |
|------|-----------|----------|
| i) | genus; | 3 |
| ii) | species; | 4 |
| iii) | cultivar. | 3 |

Full marks were awarded to candidates who described the following terms correctly and provided botanical names for plant examples.

A genus is a sub group of a family and a group of one or more species that share a range of distinct and significant characteristics e.g. *Rosa*.

A species is a group of plants that breed naturally to produce offspring with similar characteristics that keep them distinct from other populations in nature. Many specific epithets have a meaning e.g. *Cornus alba* where *alba* means white.

A cultivar is a variant from a species and has occurred in cultivation i.e. it is a cultivated variety that has usually been propagated vegetatively e.g. *Fagus sylvatica* 'Zlatia'.

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