



R2101

PLANT CLASSIFICATION, STRUCTURE & FUNCTION

Level 2

Monday 5 February 2018

09:30 – 10:50

Written Examination

Candidate Number:

Candidate Name:

Centre Number/Name:

IMPORTANT – Please read carefully before commencing:

- i) The duration of this paper is **80** minutes;
- ii) **ALL** questions should be attempted;
- iii) **EACH** question carries **10 marks**;
- iv) Write your answers legibly in the lined space provided. It is **NOT** necessary that all lined space is used in answering the questions;
- v) Use **METRIC** measurements only;
- vi) Use black or blue ink only. Pencil can be used for drawing purposes only;
- vii) Where plant names are required, they should include genus, species and where appropriate, cultivar;
- viii) Where a question requires a specific number of answers; only the first answers given that meet the question requirement will be accepted, regardless of the number of answers offered;
- ix) Please note, when the word '**distinct**' is used within a question, it means that the items have different characteristics or features.

ANSWER ALL QUESTIONS

MARKS

Q1 a) Name the stages of the plant life cycle in which **EACH** of the following takes place:

- i) reproductive growth;
- ii) vegetative growth.

1
1

i).....
.....
.....

ii).....
.....
.....

b) Describe the meaning of **EACH** of the following:

- i) deciduous tree;

2

.....
.....
.....
.....

- ii) evergreen shrub.

2

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.....
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.....

c) Name **TWO** plant examples for **EACH** of the following terms:

- i) deciduous tree;

2

.....
.....
.....
.....
.....

- ii) evergreen shrub.

2

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.....
.....
.....

Total Mark

Please see over/.....

MARKS

Q3 a) State **ONE** function of plant stems.

1

.....
.....
.....

- b) i) name **THREE** distinct functions of stem adaptations;
ii) give **ONE** distinct **NAMED** adaptation for **EACH** of the functions named in i);
iii) give **ONE NAMED** plant example for **EACH** adaptation named in ii).

By completing the table below:

Function of adaptation	Name of adaptation	Plant example
1.		
2.		
3.		

3

3

3

Total Mark

Please see over/.....

MARKS

Q4 a) Draw and fully label a diagram to show the internal structure of a dicotyledonous leaf in the space below.

8

dicotyledonous leaf

b) State **TWO** differences between dicotyledonous and monocotyledonous leaves.

2

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Total Mark

Please turn over/.....

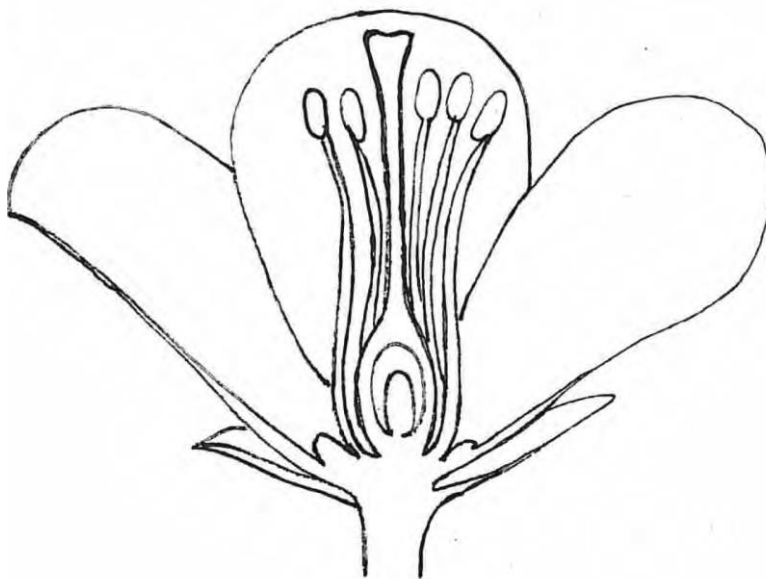
MARKS

Q6 a) Label **EACH** of the following features of a dicotyledonous flower on the diagram below:

- i) sepal;
- ii) stigma;
- iii) filament;
- iv) receptacle;
- v) nectary.

- 1
- 1
- 1
- 1
- 1

dicotyledonous flower



b) State **ONE** function of **EACH** of the flower parts listed in a).

5

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Total Mark

Please turn over/.....

Q7 a) State what is meant by **EACH** of the following terms:

MARKS

- i) seed;
- ii) fruit.

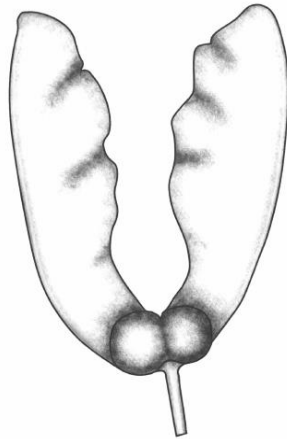
i).....
.....

1

ii).....
.....

1

b) State the dispersal mechanism for **EACH** of the fruits shown below giving a **NAMED** plant example.

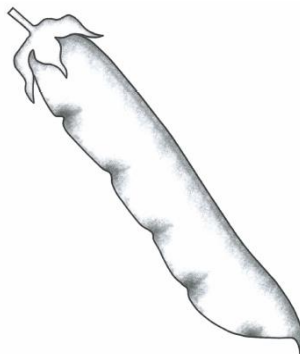


Method of dispersal.....

1

Plant example.....

1



Method of dispersal.....

1

Plant example.....

1

Question 7 continues on the facing page /...

Q8 a) Compare the processes of photosynthesis and aerobic respiration by completing the table below.

MARKS

	Photosynthesis	Aerobic respiration
Plant organs where process mainly occurs		
Cell component where process occurs		
Products of process (in words)		

2

2

2

b) State how the rate of aerobic respiration is affected by temperature.

4

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Total Mark

Please see over/...

MARKS

10

Q10 State **FIVE** distinct differences between flowering plants and conifers by completing the table below.

Flowering plants	Conifers
1.	
2.	
3.	
4.	
5.	

Total Mark

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R2101

PLANT CLASSIFICATION, STRUCTURE & FUNCTION

Level 2

Monday 5 February 2018

Candidates Registered	1086		Total Candidates Passed	779	84.95%
Candidates Entered	917	84.44%	Passed with Commendation	448	48.85%
Candidates Absent/Withdrawn	156	14.36%	Passed	331	36.10%
Candidates Deferred	13	1.20%	Failed	138	15.05%

Senior Examiner's Comments:

- 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.
- Candidates must be able to display accurate knowledge of the technical terms and concepts detailed in the syllabus, in the context of horticulture and also 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.
- 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.

MARKS

Q1 a) Name the stages of the plant life cycle in which **EACH** of the following takes place:

- i) reproductive growth; **1**
- ii) vegetative growth. **1**

b) Describe the meaning of **EACH** of the following:

- i) deciduous tree; **2**
- ii) evergreen shrub. **2**

c) Name **TWO** plant examples for **EACH** of the following terms:

- i) deciduous tree; **2**
- ii) evergreen shrub. **2**

Q1a) Most candidates were able to name the adult stage of the plant life cycle where reproductive growth takes place and the juvenile stage where vegetative growth takes place. Single words were sufficient to gain full marks for this section of the question.

Q1b) The best candidates who gained full marks provided specific meanings for each of the types of tree, i.e.

- i) Deciduous tree has a single trunk/stem/bole, is woody/has undergone secondary thickening and loses its leaves totally during autumn/winter.
- ii) Evergreen shrub is multi-stemmed at its base, is woody/has undergone secondary thickening and retains its leaves on the plant all year round.

Q1c) Candidates who provided the full botanical name for suitable plant examples were awarded full marks. These included;

- i) Deciduous tree – *Quercus robur*, *Betula pendula*, *Fagus sylvatica*
- ii) Evergreen shrub – *Choisya ternata*, *Berberis darwinii*, *Aucuba japonica*

Candidates who gave examples of semi-evergreen shrubs could not be awarded any marks.

MARKS

Q2 a) State **ONE** function of **EACH** of the following tissues:

- i) xylem;
- ii) phloem.

1
1

b) Indicate the position of the tissues named in a) on the diagram below.

2



c) State **THREE** structural characteristics for **EACH** of the tissues named in a).

6

Q2a) Maximum marks were awarded to candidates who were able to name one function of each of the plant tissues, i.e.

- i) Xylem transports water.
- ii) Phloem transports sugars.

Q2b) The majority of candidates correctly and accurately indicated the position of xylem and phloem tissue on the diagram and gained full marks.

Candidates who labelled additional tissues on the diagram could not be awarded any additional marks.

Q2c) It was important that candidates provided structural characteristics of the tissues rather than their functions or positions. Many candidates did not distinguish between xylem and phloem tissue and xylem and phloem cells.

Suitable answers that gained full marks included;

Xylem tissue contains xylem vessels and tracheids which have lignified cell walls with pits and no cell contents and are joined end to end.

Phloem tissue contains sieve tube cells and companion cells. Companion cells contain cell organelles including many mitochondria and a nucleus in their cytoplasm. Sieve tube cells have sieve plates connecting them.

Q3 a) State **ONE** function of plant stems.

1

- b) i) name **THREE** distinct functions of stem adaptations;
 ii) give **ONE** distinct **NAMED** adaptation for **EACH** of the functions named in i);
 iii) give **ONE NAMED** plant example for **EACH** adaptation named in ii).

By completing the table below:

Function of adaptation	Name of adaptation	Plant example
1.		
2.		
3.		

3

3

3

Q3a) Most candidates were able to state one function of plant stems and gained full marks. Suitable answers included; holding leaves in the best position for photosynthesis, holding flowers in the best position for pollination or for the transport of water and nutrients.

Q3b) To gain full marks candidates were required to provide three distinct functions of stem adaptations. The most popular functions included;

- Protection/defence e.g. the thorns of *Crataegus monogyna*
- Perennation/starch storage e.g. the rhizome of *Iris germanica*
- Climbing e.g. the twining stem of *Wisteria sinensis*

Additional functions of stem adaptations which were acceptable included; photosynthesis, vegetative reproduction and water storage.

Where candidates named tubers, tendrils or spines as the adaptation it was important that these were clarified as stem adaptations by the plant examples that were given, as these could also be formed from other plant organs.

Q4 a) Draw and fully label a diagram to show the internal structure of a dicotyledonous leaf in the space below.

8

dicotyledonous leaf

b) State **TWO** differences between dicotyledonous and monocotyledonous leaves.

2

Q4a) The best candidates drew the internal structure of a leaf which showed eight recognisable features in the correct position, accurately labelled and spelt. These included; cuticle, epidermis, palisade mesophyll, spongy mesophyll, air spaces, guard cells and stomata, chloroplast, xylem and phloem and vein/midrib.

Q4b) Maximum marks were gained by candidates who provided the differences between both dicotyledonous and monocotyledonous leaves. Suitable answers included;

- Dicotyledonous leaves have a variety of shapes whereas monocotyledonous leaves are strap-like
- Dicotyledonous leaves have reticulate or branching veins whereas monocotyledonous leaves have parallel veins
- Dicotyledonous leaves have their stomata mainly in the lower epidermis whereas monocotyledonous leaves have their stomata equally distributed on the upper and lower leaf surface

MARKS

Q5 a) Describe how waterlogged soils affect root respiration and plant growth.

6

b) State **ONE** distinct role of **EACH** of the following:

i) root hairs;

2

ii) endodermis.

2

Q5a) Candidates who described how waterlogged soils affect root respiration and plant growth in the correct sequence were awarded full marks. Suitable answers described that pore space in waterlogged soils is filled with water so that no oxygen is available which leads to anaerobic respiration in root cells. This produces ethanol which is toxic, causing the death of root cells and also produces a low/inefficient level of energy which together results in stunted plant growth.

Additional factors which affect root respiration and plant growth were also awarded marks, e.g. root damage affects water uptake, which is reduced. This leads to wilting and reduced mineral uptake causing chlorosis which will reduce photosynthesis and subsequently slow down plant growth. Waterlogged soils are also cold causing a reduction in root respiration.

Q5b) To be awarded full marks for this section of the question candidates needed to state a distinct role of both root hairs and endodermis. Acceptable answers included;

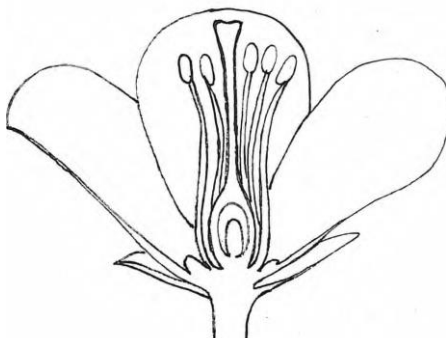
i) **Root hairs** increase the root surface area for water uptake.

ii) **Endodermis** is a control point for water and selective mineral uptake. The Casparian strip is a waxy band around the endodermal cell which forces water and dissolved minerals to pass across the cell membrane and into the endodermal cell rather than between the cells.

Q6 a) Label **EACH** of the following features of a dicotyledonous flower on the diagram below:

- | | | |
|------|-------------|---|
| i) | sepal; | 1 |
| ii) | stigma; | 1 |
| iii) | filament; | 1 |
| iv) | receptacle; | 1 |
| v) | nectary. | 1 |

dicotyledonous flower



b) State **ONE** function of **EACH** of the flower parts listed in a). **5**

Q6a) The majority of candidates were able to label the diagram of the dicotyledonous flower correctly and gained full marks.

Candidates who labelled the receptacle and stigma too low or confused petals with sepals could not be awarded any marks.

Q6b) Candidates who provided accurate detail of the function of each of the flower parts gained maximum marks. Suitable answers included;

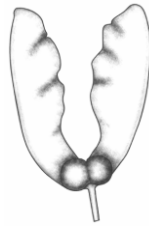
- The sepal protects the flower from damage when it is in bud
- The stigma receives pollen
- The filament supports the anther in the best position for pollen dispersal
- The receptacle is the point of attachment for the other flower parts
- The nectary contains nectar, a liquid with a high sugar content which attracts pollinators

Q7 a) State what is meant by **EACH** of the following terms:

- i) seed;
- ii) fruit.

1
1

b) State the dispersal mechanism for **EACH** of the fruits shown below giving a **NAMED** plant example.



Method of dispersal

1

Plant example

1



Method of dispersal

1

Plant example

1



Method of dispersal

1

Plant example

1

c) State **TWO** functions of fruits other than seed dispersal.

2

Q7a) Most candidates were awarded full marks for correctly stating the meaning of the terms, i.e.

- i) Seed is derived from the ovule
- ii) Fruit is derived from the ovary

Q7b) Candidates who correctly stated the dispersal mechanism for the fruits and provided a suitable plant example for each were awarded full marks. These were;

- Wind dispersal using a helicopter-like blade, e.g. *Acer campestre*
- Explosive dispersal where the pod splits open when it dries and flings out the seeds, e.g. *Lathyrus odoratus*
- Animals carry the fruit away and hoard or bury it, e.g. *Quercus robur*

Q7c) Full marks were gained by candidates who were able to state two functions of fruits. Acceptable answers included; the fruit protects the seed, it can induce dormancy/inhibit germination and it may also provide nutrients to the seed to aid germination if it rots in the soil.

Q8 a) Compare the processes of photosynthesis and aerobic respiration by completing the table below.

	Photosynthesis	Aerobic respiration	
Plant organs where process mainly occurs			2
Cell component where process occurs			2
Products of process (in words)			2

b) State how the rate of aerobic respiration is affected by temperature.

4

Q8a) Most candidates showed a good understanding of photosynthesis and aerobic respiration and gained maximum marks.

- Photosynthesis takes place in the chloroplasts of the cell in the leaves. The products of the process are glucose and oxygen.
- Aerobic respiration takes place in the mitochondria of the cell in all organs of the plant. The products of the process are water and carbon dioxide.

Q8b) The best candidates were awarded full marks by clearly stating that the rate of respiration increases with increasing temperature (or the reverse). They also stated how respiration is controlled by enzymes and that high temperatures inactivated them. Enzyme activity has a minimum temperature when the rate is very low and an optimum temperature, i.e. 25°C to 30°C, beyond which the rate slows and a maximum temperature, i.e. 35°C, at which point the enzyme is destroyed and respiration stops altogether.

MARKS

- Q9 a)** Name **ONE** plant tissue where cell division takes place. **1**
- b) Describe the process which causes plant cells to expand. **6**
- c) Name the cell component that carries out the following functions:
- i) *limits cell expansion;* **1**
 - ii) *water storage;* **1**
 - iii) *suspends cell organelles.* **1**

Q9a) The majority of candidates were able to name a plant tissue where cell division takes place, e.g. the apical meristem and the vascular cambium and gained full marks.

Q9b) Many candidates were able to describe the process which causes plant cells to expand i.e. cell expansion occurs when water passes into the cell by osmosis. Osmosis is the process whereby water passes from a high water/low solute solution outside the cell to a low water/high solute solution inside the cell across a semi-permeable cell membrane. As water enters, turgor pressure inside the cell presses outwards against the cell membrane and stretches it and therefore expands the cell.

Q9c) Full marks were awarded to candidates who were able to name the cell components that carry out specific functions i.e.

- i) The cell wall limits cell expansion
- ii) The vacuole is for water storage
- iii) Cytoplasm suspends cell organelles

Q10 State **FIVE** distinct differences between flowering plants and conifers by completing the table below.

10

Flowering plants	Conifers
1.	
2.	
3.	
4.	
5.	

Q10) Candidates who stated five distinct differences between flowering plants and conifers and presented them as pairs side by side in the table were awarded full marks. Suitable answers included;

- Flowering plants can be evergreen and deciduous whereas conifers are usually evergreen
- Flowering plants are woody and herbaceous whereas conifers are usually woody
- Flowering plants have all life cycles, e.g. annual, biennial, perennial, whereas conifers are usually perennial
- Flowering plants have varied leaf shapes whereas conifers have needles or scale leaves
- Flowering plants are wind and insect pollinated whereas conifers are wind pollinated
- Flowering plants occupy a wide range of habitats whereas conifers generally occupy cold or dry habitats

Candidates who confused flowering plants/conifers with monocotyledons/dicotyledons could not be awarded any marks.
