



R2101

PLANT CLASSIFICATION, STRUCTURE AND FUNCTION

Level 2

Monday 14 February 2011

9.30 – 10.20

Written Examination

Candidate Number:

Candidate Name:

Centre Number/Name:

IMPORTANT – Please read carefully before commencing:

- i) The duration of this paper is **50 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.

Answer all questions

Marks

1. List **FIVE** differences between gymnosperms and angiosperms by completing the table below:

10

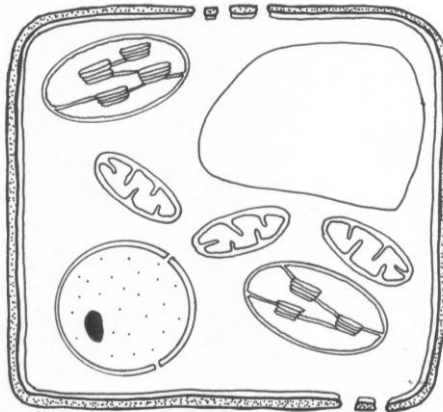
| Gymnosperms | Angiosperms |
|-------------|-------------|
| | |
| | |
| | |
| | |
| | |

Please see over

2. a) Name **EACH** of the following features on the diagram provided:

- | | |
|--------------------|---|
| i) cell membrane; | 1 |
| ii) nucleus; | 1 |
| iii) chloroplast; | 1 |
| iv) cytoplasm; | 1 |
| v) vacuole; | 1 |
| vi) cell wall; | 1 |
| vii) mitochondria. | 1 |

Simple plant cell



- b) State **TWO** cell processes which result in plant growth. 2

.....

.....

.....

.....

.....

- c) Define the term 'secondary growth'. 1

.....

.....

.....

Please turn over.....

3. a) Define the term 'adventitious root'.

1

.....

.....

.....

.....

- b) Identify **THREE** root adaptations and state their function. Give **ONE NAMED** plant example for **EACH** adaptation by completing the table below:

9

| Root adaptation | Function | Plant example |
|-----------------|----------|---------------|
| | | |
| | | |
| | | |

Please see over.....

4. a) Name the process by which water is lost from the leaf. 1

.....

.....

- b) Describe how **TWO** environmental factors affect the rate of water loss from leaves. 6

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- c) State **THREE** ways that leaves may be adapted to limit water loss. 3

.....

.....

.....

.....

.....

.....

.....

Please turn over.....

5. a) Define the term 'fruit'. 1

.....

.....

.....

- b) Name **ONE** example for **EACH** of the following fruit types:

- | | |
|--------------------------|---|
| i) dehiscent; | 1 |
| ii) indehiscent; | 1 |
| iii) fleshy (succulent). | 1 |

.....

.....

.....

.....

- c) Describe how **EACH** of the fruit types named in b) aid seed dispersal. 6

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Please see over.....

6. a) Define **EACH** of the following terms and give **ONE NAMED** plant example:

- | | |
|----------------|---|
| i) annual; | 2 |
| ii) ephemeral; | 2 |
| iii) biennial; | 2 |
| iv) perennial. | 2 |

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- b) State the difference between woody and herbaceous perennials. 2

.....

.....

.....

Please turn over.....

7. a) State the basic equation for photosynthesis in words. **2**

.....

.....

.....

- b) List **THREE** environmental factors which affect the rate of photosynthesis. **3**

.....

.....

.....

.....

- c) Draw a clearly labelled diagram showing the internal structure of a dicotyledonous leaf. **5**

Please see over

8. a) State **ONE** function for **EACH** of the following flower parts:

- | | |
|---------------|----------|
| i) sepals; | 1 |
| ii) petals; | 1 |
| iii) anther; | 1 |
| iv) filament; | 1 |
| v) stigma; | 1 |
| vi) ovary. | 1 |

.....

.....

.....

.....

.....

.....

.....

.....

b) State **TWO** differences between wind and insect pollinated flowers, by completing the table below:

4

| Wind pollinated | Insect pollinated |
|-----------------|-------------------|
| | |
| | |

Please turn over.....

9. a) State the meaning of the term 'phototropism'. 3

.....

.....

.....

- b) Describe the role of auxin in the phototropic response of a plant shoot. 3

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

- c) Identify **TWO** plant development processes involving auxins, (other than tropisms). 2

.....

.....

.....

.....

- d) Name **TWO** tropisms other than phototropism. 2

.....

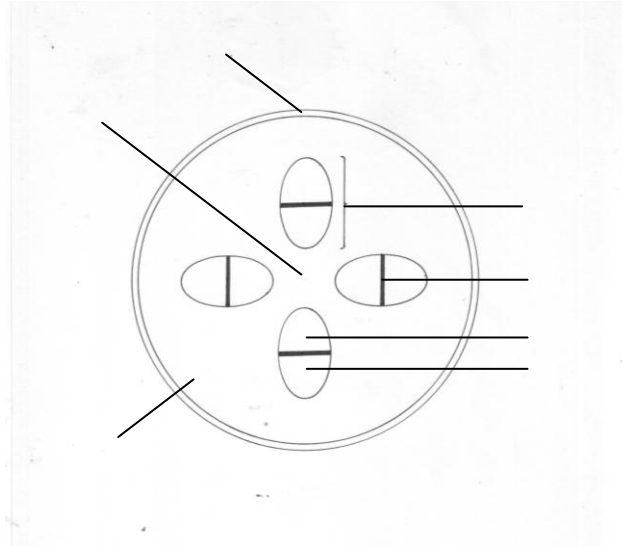
.....

Please see over.....

10. a) Label **EACH** of the stem tissues on the diagram.

7

Cross section of a dicotyledonous stem



- b) State the function of **THREE** of the tissues labelled in a).

3

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**© These questions are the property of the Royal Horticultural Society.
They may not be reproduced or sold.**

**The Royal Horticultural Society, Wisley, Woking, Surrey GU23 6QB
RHS Registered Charity No: 222879/SC038262**



R2101

PLANT CLASSIFICATION, STRUCTURE AND FUNCTION

Level 2

Monday 14 February 2011

| | | | |
|----------------------------------|--------------|-------------------------------|--------------|
| Candidates Registered | 965 | Pass with Commendation | 306 (37.36%) |
| Candidates Entered | 819 | Pass | 336 (41.03%) |
| Absent/Withdrawn/Deferred | 146 | Fail | 177 (21.61%) |
| Total Candidates Passed | 642 (78.39%) | | |

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, and preferably 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.
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:

Marks

1. List **FIVE** differences between gymnosperms and angiosperms by completing the table below:

10

| <i>Gymnosperms</i> | <i>Angiosperms</i> |
|---------------------------|---------------------------|
| | |
| | |
| | |
| | |
| | |

Candidates who showed a detailed knowledge of the differences between gymnosperms and angiosperms and were able to compare specific aspects side by side in the table gained higher marks. Good

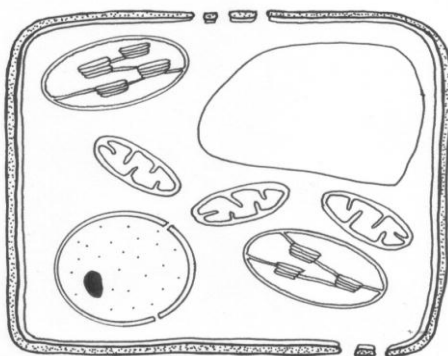
examples given included; Gymnosperms: exposed seeds in cones versus Angiosperms: flowers producing seeds enclosed in a fruit, or Gymnosperms: mainly woody perennials versus Angiosperms: woody and herbaceous perennials, annuals and biennials.

Unfortunately a number of candidates misread gymnosperms and angiosperms for monocotyledons and dicotyledons.

2. a) Name **EACH** of the following features on the diagram provided:

- | | |
|--------------------|---|
| i) cell membrane; | 1 |
| ii) nucleus; | 1 |
| iii) chloroplast; | 1 |
| iv) cytoplasm; | 1 |
| v) vacuole; | 1 |
| vi) cell wall; | 1 |
| vii) mitochondria. | 1 |

Simple plant cell



- b) State **TWO** cell processes which result in plant growth. 2
- c) Define the term 'secondary growth'. 1

- a) Candidates who gained high marks for this question were able to accurately label the diagram of the cell. The best answers included those where candidates were able to distinguish between chloroplasts and mitochondria as the latter are smaller.
- b) Cell processes which result in plant growth were correctly identified as cell division and expansion.
- c) Definitions of secondary growth were varied but the ones that gained most marks included statements that growth is widthways

or lateral. Some candidates described the process of secondary growth which was not required.

3. a) Define the term 'adventitious root'. 1
- b) Identify **THREE** root adaptations and state their function. Give **ONE NAMED** plant example for **EACH** adaptation by completing the table below: 9

| Root adaptation | Function | Plant example |
|------------------------|-----------------|----------------------|
| | | |
| | | |
| | | |

- a) Candidates who gave a concise definition of adventitious roots rather than providing examples of them and included reference to such roots arising from plant parts other than the radicle or primary root system gained high marks.
- b) The highest marks were awarded for root adaptations that were accurately named e.g. 'swollen tap root' rather than 'tap root' which is not an adaptation. Candidates demonstrating an understanding of the function of root adaptations gained higher marks e.g. 'starch storage for perennation' or 'climbing to gain light for photosynthesis' rather than just 'food storage' or 'climbing'. The best answers included full botanical names for plant examples. Marks could not be awarded for stem adaptations.

4. a) Name the process by which water is lost from the leaf. 1
- b) Describe how **TWO** environmental factors affect the rate of water loss from leaves. 6
- c) State **THREE** ways that leaves may be adapted to limit water loss. 3

- a) The majority of candidates correctly identified 'transpiration' as the process by which water is lost from leaves.
- b) Most candidates were able to name environmental factors that affect the rate of water loss from leaves e.g. temperature, humidity, wind but the best responses included descriptions of the effect e.g. 'an increase in wind led to an increase in water loss'.
- c) Adaptations of leaves required full statements e.g. 'thick waxy cuticle' and 'sunken stomata on the underside of leaves' for marks as these are true adaptations rather than waxy leaves or stomata on the underside of leaves.
5. a) *Define the term 'fruit'.* 1
- b) *Name **ONE** example for **EACH** of the following fruit types:*
- i) *dehiscent;* 1
- ii) *indehiscent;* 1
- iii) *fleshy (succulent).* 1
- c) *Describe how **EACH** of the fruit types named in b) aid seed dispersal.* 6
- a) The best definitions were concise and stated that the fruit was a ripened or fertilised ovary without giving any further information.
- b) Candidates who named the type of fruit e.g. capsule, nut or drupe were better rewarded than those who gave plant examples.
- c) The best descriptions of how seeds are dispersed for each fruit type were where the candidate focused on the method of dispersal and emphasised the way in which seeds move away from the parent plant. These candidates also showed an understanding of the difference between dehiscence and indehiscence in terms of whether the fruit did or did not split to release seeds.
6. a) *Define **EACH** of the following terms and give **ONE NAMED** plant example:*
- i) *annual;* 2
- ii) *ephemeral;* 2
- iii) *biennial;* 2
- iv) *perennial.* 2

- b) *State the difference between woody and herbaceous perennials.* **2**
- a) The best definitions were those that were to the point and gave the full botanical name for the plant example; e.g. for a perennial it is necessary to state that the plant lives for more than two years/seasons rather than many years/seasons. Care is needed to ensure that plant examples are true representatives of the plant type e.g. *Impatiens walleriana*, although grown as an annual in this country, is naturally a perennial whereas *Tagetes patula* is a true annual. Candidates who gave only the generic name e.g. *Digitalis* as an example of a biennial could not be awarded a mark as the genus contains both biennial and perennial species.
- b) When stating the difference between woody and herbaceous perennials the best answers included a reference to secondary growth.
7. a) *State the basic equation for photosynthesis in words.* **2**
- b) *List **THREE** environmental factors which affect the rate of photosynthesis.* **3**
- c) *Draw a clearly labelled diagram showing the internal structure of a dicotyledonous leaf.* **5**
- a) The majority of candidates were able to provide the basic equation for photosynthesis (additional information was not required).
- b) Most candidates were able to list three environmental factors which affect the rate of photosynthesis including light, temperature, water etc.
- c) Those candidates who followed the key words e.g. state and list in part a) and b) of the question had adequate time to draw a clearly labelled diagram of the internal structure of the leaf. The best answers provided names of the relevant features e.g. epidermis, palisade and spongy mesophyll layers, vascular tissue, stomata and guard cells etc. with some indication of their structure on the diagram. Drawings of the external structure of the leaf were not acceptable.
8. a) *State **ONE** function for **EACH** of the following flower parts:*
- i) *sepals;* **1**
- ii) *petals;* **1**
- iii) *anther;* **1**
- iv) *filament;* **1**
- v) *stigma;* **1**

vi) ovary. 1

b) State **TWO** differences between wind and insect pollinated flowers, by completing the table below: 4

| Wind pollinated | Insect pollinated |
|------------------------|--------------------------|
| | |
| | |

- a) The majority of candidates were able to state the function of each flower part e.g. the sepals protect the flower and the filament holds the anther in the correct position for pollen dispersal.
- b) Most candidates were able to state differences between wind and insect pollinated flowers and included statements between flower structure and colour, the position of the stigma and style and the type and amount of pollen. The best answers which gained high marks included some detail e.g. insignificant petals reduced in size and dull/green rather than small petals or brightly coloured petals with nectar guides which attract insects to nectaries rather than showy petals.

9. a) State the meaning of the term 'phototropism'. 3

b) Describe the role of auxin in the phototropic response of a plant shoot. 3

c) Identify **TWO** plant development processes involving auxins, (other than tropisms). 2

d) Name **TWO** tropisms other than phototropism. 2

- a) Better answers were those that were concise and included the terms growth and light with an indication that this is directional. Details of the mechanism in the shoot should be described in part b) and not part a) of the question.
- b) Candidates who were able to demonstrate that auxin is produced at the shoot tip and redistributed or becomes concentrated on the shady side of the shoot stimulating cell expansion gained full marks.
- c) Examples of plant development processes which were acceptable included; apical dominance, fruit development, leaf retention, root development etc. Those candidates who provided

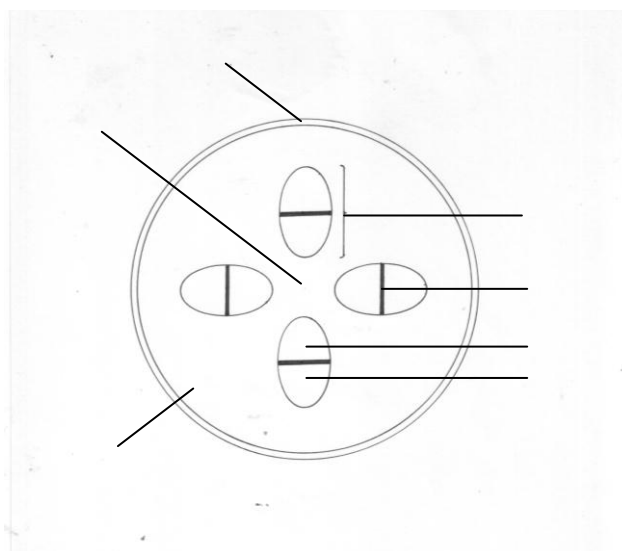
a brief explanation of each term gained full marks.

- d) Most candidates were able to name two tropisms e.g. thigmotropism, hydrotropism, geotropism.

10. a) Label **EACH** of the stem tissues on the diagram.

7

Cross section of a dicotyledonous stem



- b) State

a).

3

- a) Candidates who were able to correctly identify and label the tissues of a dicotyledonous stem were able to gain high marks. A few candidates confused parts of the cell with those of the stem.
- b) Most candidates were able to state the functions of the tissues of the stem but the highest marks were gained by those who gave brief details of the functions; e.g. xylem transports water and minerals, the epidermis is for protection from water loss, damage and disease while the cortex stores starch and provides support through turgor pressure.

**© These questions are the property of the Royal Horticultural Society.
They may not be reproduced or sold.**

**The Royal Horticultural Society, Wisley, Woking, Surrey GU23 6QB
RHS Registered Charity No: 222879/SC038262**

May 2011