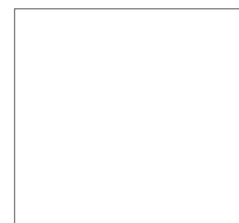




Including examiner comments



**R2101**

**PLANT CLASSIFICATION, STRUCTURE & FUNCTION**

**Level 2**

**Monday 19 June 2023**

**09:00 – 10:20**

**Written Examination**

**Candidate Number:** .....

**Candidate Name:** .....

**Centre 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 spaces 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. Ensure that all diagrams are labelled accurately with the line touching the named object;
- 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)** Describe what is meant by the following plant life cycles, giving a **NAMED** example for **EACH**:

Life cycle (term)	Meaning of term	Plant example
Ephemeral		
Biennial		
Perennial		

2

2

2

b) State the difference between the following types of plants:

- i) herbaceous perennials and woody perennials
- ii) evergreen perennials and semi-evergreen perennials

2

2

i).....  
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ii).....  
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Total Mark
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**Please see over/.....**

**MARKS**

**Q2 a)** . State **ONE** function of **EACH** of the following seed parts:

- i) testa
- ii) radicle
- iii) micropyle
- iv) endosperm

**1**  
**1**  
**1**  
**1**

i).....  
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ii).....  
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iii).....  
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iv).....  
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**b)** Describe the method of seed dispersal for a **NAMED** plant example for **EACH** of the following:

- i) wind dispersal
- ii) water dispersal

**3**  
**3**

i).....  
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ii).....  
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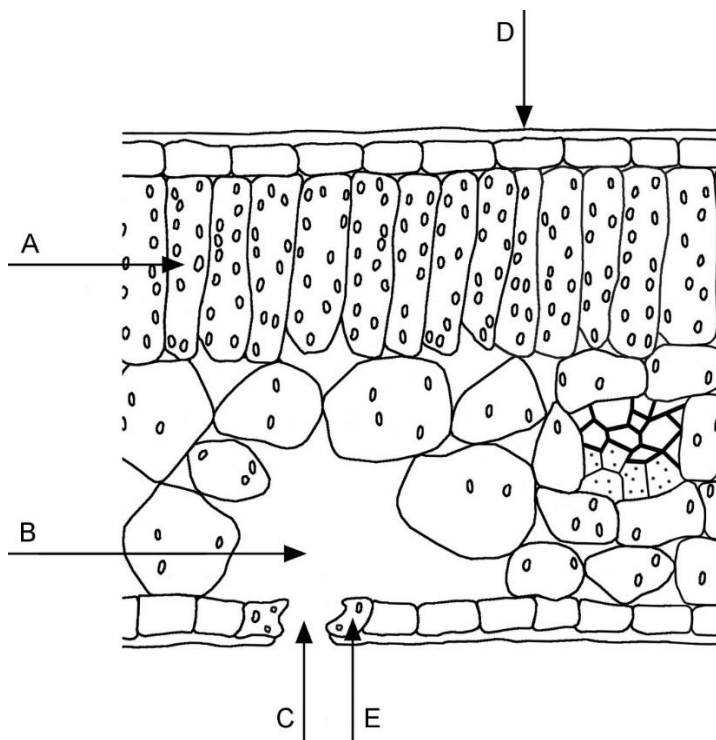
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**Q3** For the diagram below:

- i) name the features labelled A – E
- ii) name **ONE** function for **EACH** of the features

by completing the table below.



Section through a dicotyledonous (eudicot) leaf

	<b>Name of feature</b>	<b>Function of feature</b>
<b>A</b>		
<b>B</b>		
<b>C</b>		
<b>D</b>		
<b>E</b>		

Total Mark

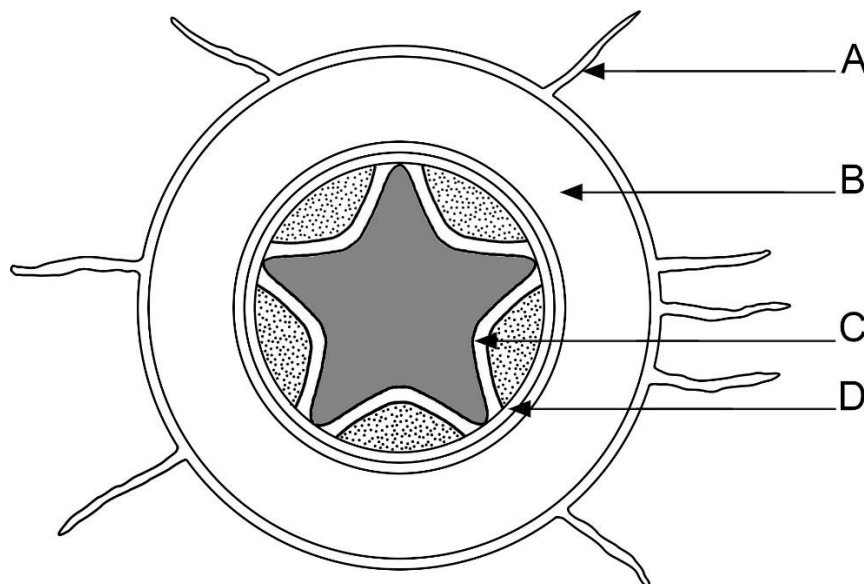
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**Q5 a)** Identify which features labelled on the diagram below enable the following actions:

	<b>Actions</b>	<b>Feature (A-D)</b>
i)	uptake of water from the soil	
ii)	production of lateral roots	
iii)	starch storage	
iv)	production of xylem and phloem	

1  
1  
1  
1



TS young dicotyledonous (eudicot) root

b) Name the features labelled in a).

- A).....
- B).....
- C).....
- D).....

1  
1  
1  
1

c) State the difference between adventitious and tap roots.

.....  
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2

Total Mark

Please see over/.....



**Q7 a)** State the main function of a leaf.

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**MARKS**  
**1**

**b)** Describe **THREE** leaf adaptations, **EACH** with a distinct function by completing the table below:

<b>Leaf adaptation</b>	<b>Distinct function of adaptation</b>	<b>Plant example</b>
<b>1.</b>		
<b>2.</b>		
<b>3.</b>		

**3**

**3**

**3**

Total Mark

**Please see over/.....**



Q8 a) State the difference between a simple and a compound leaf giving **ONE** plant example for **EACH**.

4

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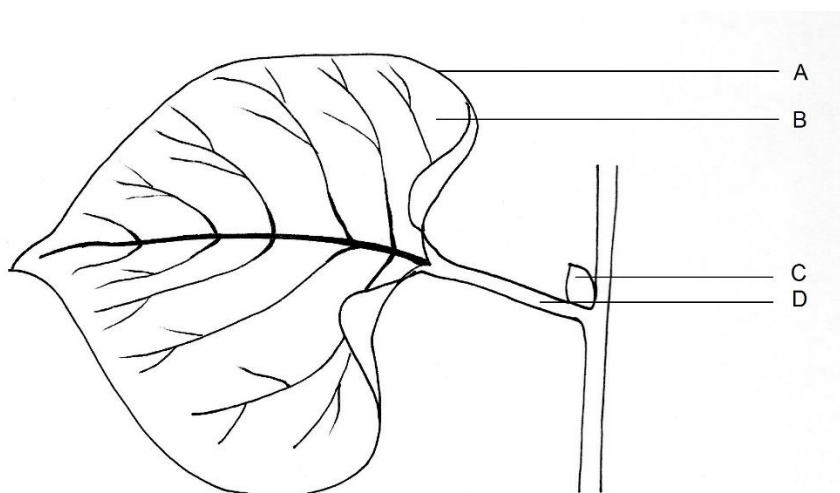
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b) Name the features labelled **A-D** on the diagram below:

4



A).....

B).....

C).....

D).....

c) State **ONE** difference between a monocotyledonous and a dicotyledonous (eudicot) leaf.

2

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Total Mark
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Please turn over/.....

**Q9 a)** State what is meant by the term 'plant tissue'.

**MARKS**  
**2**

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b) For **EACH** of the plant tissues listed below:

- i) State **ONE** function
- ii) Name the plant part/s where the tissue is found

**Spongy mesophyll**

Function

**2**

.....  
.....

Plant part/s.

.....  
.....

**Xylem**

Function

**2**

.....  
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Plant part/s

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**Pith**

Function

**2**

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.....

Plant part/s

.....  
.....

**Apical meristem**

Function

**2**

.....  
.....

Plant part/s

.....  
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Total Mark
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**Please see over/.....**

**MARKS**

**Q10 a)** State what is meant by **EACH** of the following terms:

- i) pollination
- ii) fertilisation

**3**  
**2**

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ii).....  
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b) State **FIVE** distinct characteristics of a wind pollinated flower.

**5**

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## R2101

### PLANT CLASSIFICATION, STRUCTURE & FUNCTION

#### Level 2

Monday 19 June 2023

<b>Candidates Registered</b>	<b>247</b>		<b>Total Candidates Passed</b>	<b>163</b>	<b>73%</b>
Candidates Entered	224	91%	Passed with Commendation	61	27%
Candidates Absent/Withdrawn	23	9%	Passed	102	46%
Candidates Deferred	0	0%	Failed	61	27%

#### 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 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.
- 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.

**Q1 a)** Describe what is meant by the following plant life cycles, giving a **NAMED** example for **EACH**:

<b>Life cycle (term)</b>	<b>Meaning of term</b>	<b>Plant example</b>
<b>Ephemeral</b>		
<b>Biennial</b>		
<b>Perennial</b>		

b) State the difference between the following types of plants:

- i) herbaceous perennials and woody perennials
- ii) evergreen perennials and semi-evergreen perennials

~~~~~

**Q1a)** Candidates who provided precise meanings of specific plant life cycles were awarded full marks. Suitable answers included:

| <b>Life cycle (term)</b> | <b>Meaning of term</b>                                                                                                                 | <b>Plant example</b>                        |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| <b>Ephemeral</b>         | An ephemeral is a plant that completes several generations in one growing season/year.                                                 | Senecio vulgaris<br>Capsella bursa-pastoris |
| <b>Biennial</b>          | A biennial is a plant that completes its lifecycle in two growing seasons/years.                                                       | Digitalis purpurea<br>Beta vulgaris         |
| <b>Perennial</b>         | A perennial plant is one that persists for more than three years or completes its life cycle in more than three growing seasons/years. | Quercus robur<br>Alchemilla mollis          |

**Q1b)** The majority of candidates were able to correctly state the difference between specific types of plants and achieved maximum marks. These included:

i) **herbaceous perennials and woody perennials**

An herbaceous perennial has no woody tissue/secondary thickening and dies down during the winter whereas a woody perennial has woody tissue/secondary thickening and retains a framework of stems/branches over winter.

ii) **evergreen perennials and semi-evergreen perennials**

An evergreen perennial retains foliage throughout the year/over winter/has persistent leaves whereas a semi-evergreen perennial sheds leaves for a short period/retains their leaves in mild winters/loses leaves in harsh winters.

Candidates who described a deciduous perennial instead of a semi-evergreen perennial could not be awarded any marks.



**Q2a)** . State **ONE** function of **EACH** of the following seed parts:

- i) testa
- ii) radicle
- iii) micropyle
- iv) endosperm

b) Describe the method of seed dispersal for a **NAMED** plant example for **EACH** of the following:

- i) wind dispersal
- ii) water dispersal

~~~~~

**Q2a)** Full marks were gained by candidates who were able to provide one function of specific seed parts. Acceptable answers included:

- i) **testa** prevents entry of water or oxygen and may impose dormancy.
- ii) **radicle** becomes the first root or the new root. It provides initial anchorage for germination or the intake of water.
- iii) **micropyle** allows water to enter to trigger germination. It is the point at which the radicle emerges.
- iv) **endosperm** stores starch/carbohydrate.

Candidates who confused endosperm with endodermis could not be awarded any marks.

**Q2b)** Good descriptions for specific methods of seed dispersal were provided by the best candidates who were awarded full marks. Suitable answers included:

**i) wind dispersal**

Seeds that have a blade/samara/wing enables it to spin away from the parent plant in a 'helicopter-like action' e.g. *Fraxinus excelsior*.

Seeds that have a parachute/pappus/cypsela/filaments allow the seed to drift or float on the wind away from the parent plant e.g. *Taraxacum officinale*.

Seeds enclosed in a censor/pepper pot are shaken by the wind, moving the stem. The seeds exit through pores in the censor and are dispersed away from the parent plant e.g. *Papaver rhoeas*.

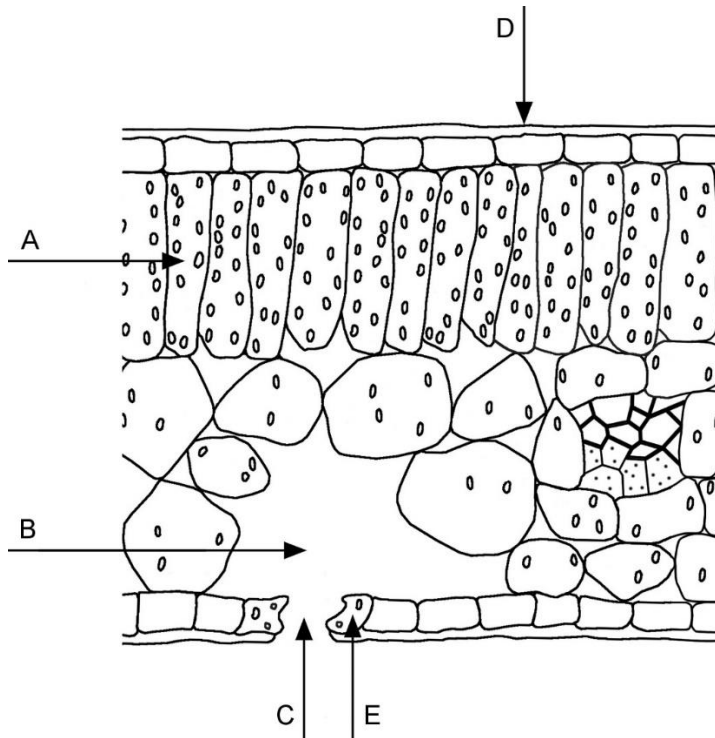
**ii) water dispersal**

There is a spongy fruit wall/fruit wall with air spaces/coating of coir/ the seed is buoyant. This enables the seed to float on the currents/ocean currents/water, away from the parent plant e.g. *Cocus nucifera*.

**Q3** For the diagram below:

- i) name the features labelled A – E
- ii) name **ONE** function for **EACH** of the features

by completing the table below.



Section through a dicotyledonous (eudicot) leaf

	Name of feature	Function of feature
<b>A</b>		
<b>B</b>		
<b>C</b>		
<b>D</b>		
<b>E</b>		

**Q3)** Candidates who were able to correctly name and provide functions of specific features of a dicotyledonous (eudicot) leaf achieved maximum marks.

	<b>Name of feature</b>	<b>Function of feature</b>
<b>A</b>	Palisade mesophyll	Main site of photosynthesis. It contains chloroplasts.
<b>B</b>	Intercellular or sub stomatal air space (air space)	Allows gaseous exchange. Allows water vapour or diffusion to move.
<b>C</b>	Stomata	Enables gaseous exchange or enables entry of carbon dioxide or exit of oxygen. Enables loss of water vapour.
<b>D</b>	Upper cuticle (cuticle)	Protects against water loss or damage from pests and diseases.
<b>E</b>	Guard cell	Controls the opening and closing of the stomata. Controls the rate of gaseous exchange or the loss of water vapour or oxygen.

**Q4 a)** Name the site of respiration in a plant cell.

b) List the products of aerobic respiration.

c) Describe the significance of aerobic and anaerobic respiration in propagation.

~~~~~

**Q4a)** Mitochondrion was correctly named as the site of respiration in a plant cell by most candidates who were awarded full marks.

**b)** To achieve maximum marks candidates were required to list the products of aerobic respiration.

Acceptable answers were:

Water, carbon dioxide, energy/ATP.

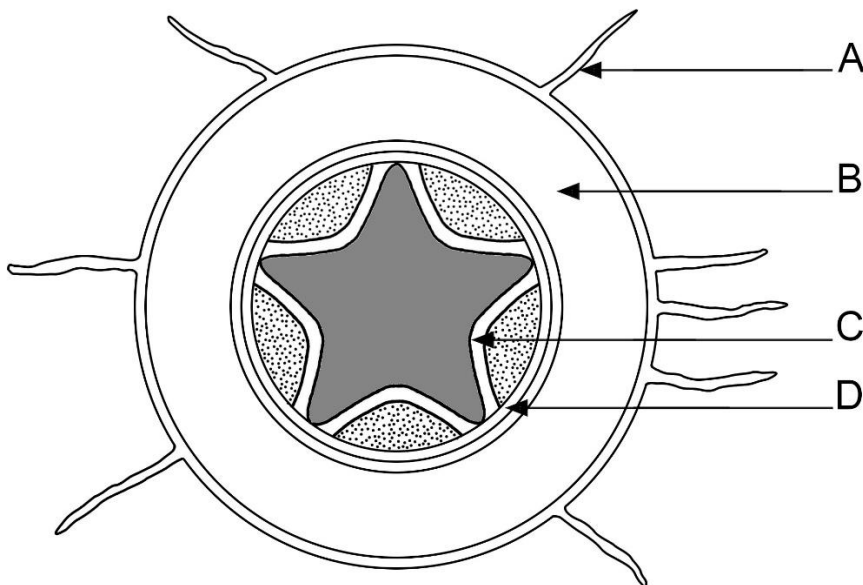
**c)** Good descriptions of the significance of aerobic and anaerobic respiration in propagation were provided by the best candidates who gained full marks. Suitable answers included:

Aerobic respiration releases energy stored in plant tissues or that it releases energy from the products of photosynthesis. This energy enables faster establishment of cuttings and growth/cell division/metabolism, growth of new roots etc. Aerobic respiration also speeds up the metabolism for germination and growth in seeds.

Anaerobic respiration produces very little energy which means that growth/germination is slow/stunted. Anaerobic respiration produces toxic ethanol which leads to the death of seedlings or seeds.

**Q5 a)** Identify which features labelled on the diagram below enable the following actions:

|      | <b>Actions</b>                 | <b>Feature (A-D)</b> |
|------|--------------------------------|----------------------|
| i)   | uptake of water from the soil  |                      |
| ii)  | production of lateral roots    |                      |
| iii) | starch storage                 |                      |
| iv)  | production of xylem and phloem |                      |



TS young dicotyledonous (eudicot) root

- b) Name the features labelled in a).
- c) State the difference between adventitious and tap roots.

**Q5a)** Candidates who were able to identify which features on the diagram enable the following actions were awarded full marks. These were:

|      | <b>Actions</b>                 | <b>Feature (A-D)</b> |
|------|--------------------------------|----------------------|
| i)   | uptake of water from the soil  | A                    |
| ii)  | production of lateral roots    | B                    |
| iii) | starch storage                 | C                    |
| iv)  | production of xylem and phloem | D                    |

**b)** The best candidates were able to name the features labelled in the diagram and achieved full marks. These were:

**A** – root hair

**B** – cortex

**C** – vascular cambium

**D** – pericycle

**c)** Most candidates were able to state that adventitious roots grow from plant parts other than the radicle. Some marks were gained for stating that they grow on a stem or may have a different function e.g. climbing.

Tap roots grow from the radicle. Some marks were gained for stating that tap roots are the main/central root or that they have lateral roots and may be adapted for storage.

**Q6 a)** Describe how the availability of mineral nutrients affects photosynthesis.

b) Describe the uptake and transport of mineral nutrients from the soil to the growing point of the stem.

~~~~~

**Q6 a)** Candidates were required to describe how the availability of mineral nutrients affects photosynthesis to be awarded maximum marks. The best answers described how chlorophyll is an important component of the process of photosynthesis. The nutrients iron, magnesium and nitrogen are constituents of chlorophyll and if any these are in short supply (the law of limiting factors) chlorophyll production is reduced and the process of photosynthesis is slowed down. This subsequently affects the growth of plants.

b) Good descriptions of the uptake and transport of mineral nutrients from the soil to the growing point of the stem were provided by the best candidates who gained full marks. These included:

Mineral nutrients are dissolved in water in the soil and are absorbed through the root hairs by a process called active transport against the concentration gradient. The energy for this is provided from respiration (ATP). The uptake of minerals is selective and they pass across the root to the endodermis using apoplast (move between root cells) and symplast (through cells) pathways. This is regulated by the Casparian strip. The minerals travel through the xylem vessels of the root and stem in an upward movement in the transpiration stream (mass flow).

**Q7 a)** State the main function of a leaf.

**b)** Describe **THREE** leaf adaptations, **EACH** with a distinct function by completing the table below:

Leaf adaptation	Distinct function of adaptation	Plant example
1.		
2.		
3.		

~~~~~

**Q7 a)** Photosynthesis was correctly stated by most candidates as the main function of a leaf and were awarded full marks.

**b)** A range of leaf adaptations with distinct functions were provided by many candidates who gained maximum marks. Suitable answers included:

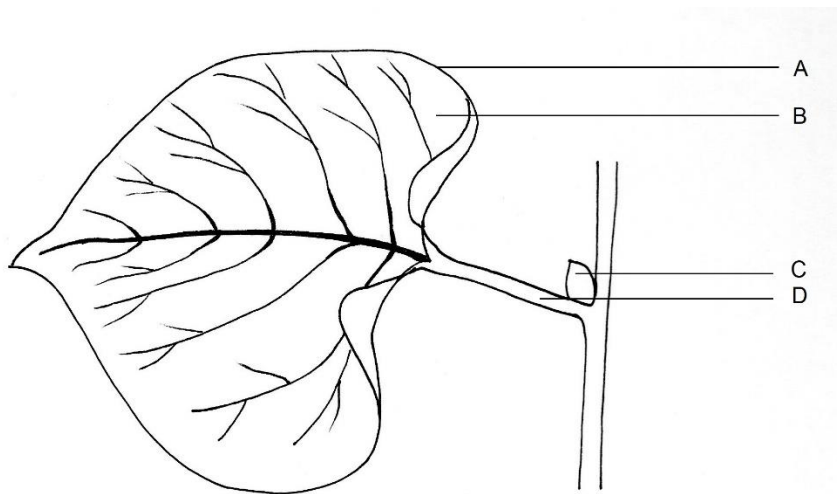
| Leaf adaptation                                 | Distinct function of adaptation                 | Plant example                                             |
|-------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------|
| 1. Bulb/bulb scale                              | Starch storage/perennation                      | <i>Narcissus pseudonarcissus</i><br><i>Tulipa greigii</i> |
| 2. Leaf spines                                  | Defence/protection from herbivores              | <i>Ilex aquifolium</i>                                    |
| 3. Tendril (leaflet tendril or twining petiole) | Climbing to increase photosynthesis/competition | <i>Pisum sativum</i><br><i>Vicia faba</i>                 |

Other leaf adaptations that gained marks included: Leaf hairs/glandular hairs/stinging hairs, swollen/succulent leaves, colourful bracts, foliar embryos, carnivorous leaves.



**Q8 a)** State the difference between a simple and a compound leaf giving **ONE** plant example for **EACH**.

b) Name the features labelled **A-D** on the diagram below:



c) State **ONE** difference between a monocotyledonous and a dicotyledonous (eudicot) leaf.

~~~~~

**Q8 a)** Maximum marks were awarded to candidates who correctly stated that a simple leaf consists of a single blade/lamina e.g. *Alchemilla mollis*, *Catalpa bignonioides* whereas a compound leaf is formed of several leaflets e.g. *Aesculus hippocastanum*, *Rosa rugosa*.

b) Many candidates were able to name the specific features of the leaf and achieved full marks. These were:

**A** – margin

**B** – lamina

**C** - axillary /lateral bud

**D** - petiole

c) Candidates were required to state one difference between a monocotyledonous and a dicotyledonous (eudicot) leaf. Suitable answers which were awarded maximum marks included:

- monocotyledonous leaves have parallel veins whereas dicotyledonous leaves have reticulate veins
- monocotyledonous leaves are strap-like in form whereas dicotyledonous leaves are varied/broad
- monocotyledonous leaves have an entire margin whereas dicotyledonous leaves may have a serrate/lobed etc. margin
- Monocotyledonous leaves do not have a petiole whereas dicotyledonous leaves are petiolate.

**Q9 a)** State what is meant by the term 'plant tissue'.

b) For **EACH** of the plant tissues listed below:

- i) State **ONE** function
- ii) Name the plant part/s where the tissue is found

**Spongy mesophyll**

Function  
Plant part/s.

**Xylem**

Function  
Plant part/s

**Pith**

Function  
Plant part/s

**Apical meristem**

Function  
Plant part/s

~~~~~

**Q9 a)** The majority of candidates correctly stated that plant tissue is a collection of cells which carry out a specific function and gained full marks.

b) To achieve maximum marks candidates were required to state a function of, and name the plant part/s where specific plant tissues are found. Acceptable answers included:

**Spongy mesophyll**

Function – photosynthesis/gas exchange  
Plant part/s – leaf

**Xylem**

Function – transport of water and minerals  
Plant part/s – root, stem, leaf

**Pith**

Function – starch storage  
Plant part/s – stem

**Apical meristem**

Function – cell division/extension growth  
Plant part/s – stem, root

**Q10a)** State what is meant by **EACH** of the following terms:

- i) pollination
- ii) fertilisation

b) State **FIVE** distinct characteristics of a wind pollinated flower.

~~~~~

**Q10a)** The best candidates had a good understanding of the meaning of specific terms and were awarded full marks. Acceptable answers included:

- i) **pollination** is the transfer of pollen from the anther to the stigma.
- ii) **fertilisation** is the fusion of a male gamete with a female gamete/ovum.

Candidates who confused pollination with fertilisation could not be awarded any marks.

**b)** A range of characteristics of a wind pollinated flower were provided by most candidates who achieved maximum marks. Suitable answers included:

- reduced or absent petals
- flowers in catkins
- feathery stigma
- the stigma dangles outside the flower
- stamens are hinged or versatile
- pollen is smooth
- pollen is produced in large quantities
- pollen is light/has small grains.

Candidates who provided negative comments e.g. wind pollinated flowers do not have any scent could not be awarded any marks.

\*\*\*\*\*