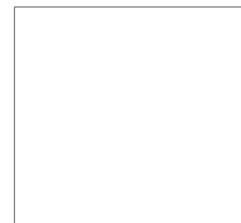




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R2101

PLANT CLASSIFICATION, STRUCTURE & FUNCTION

Level 2

Monday 19 June 2017

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.

Ofqual Unit Code K/505/2967

Please turn over/.....

ANSWER ALL QUESTIONS

MARKS

Q1 a) State what is meant by the following botanical terms, giving a **NAMED** plant example for **EACH**, by completing the table below.

| Botanical term | Meaning of botanical term | Plant example |
|----------------|---------------------------|---------------|
| Ephemeral | | |
| Annual | | |
| Biennial | | |

2

2

2

b) State the significance of juvenile growth in **TWO NAMED** horticultural situations.

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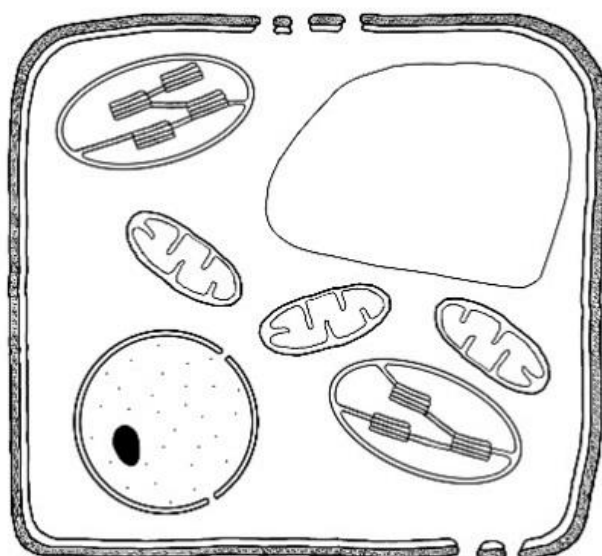
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| Total Mark |
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Please see over/.....

Q2 a) Label **EACH** of the following plant cell components on the diagram below:

- i) cell membrane;
- ii) vacuole;
- iii) cell wall;
- iv) chloroplast;
- v) nucleus.

Typical plant cell



b) State **ONE** function for **EACH** of the plant cell components listed in a).

- i)
- ii)
- iii)
- iv)
- v)

Total Mark

Please turn over/.....

Q5 a) Name the main function of leaves.

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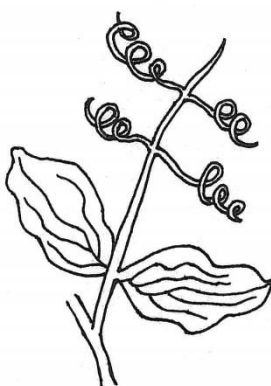
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b) Identify **EACH** of the leaf adaptations (X,Y,Z) shown below, giving **ONE NAMED** plant example for **EACH**.

X



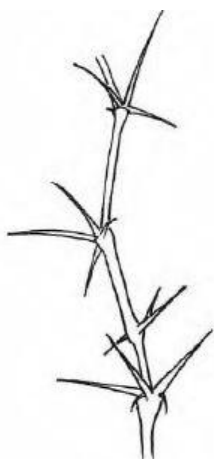
Name of adaptation.....

Plant example

1

1

Y



Name of adaptation.....

Plant example

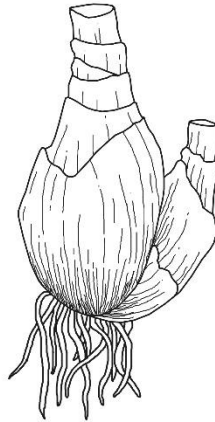
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Q5

Z

MARKS



Name of adaptation.....

1

Plant example.....

1

c) State the function of the leaf adaptations X, Y, Z shown in b).

X.....

1

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Y.....

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Z.....

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Total Mark

Please turn over/.....

Q6 Describe the pathway of water movement from the soil to the stem, with the aid of a fully labelled diagram in the space below.

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| Total Mark |
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Please see over/.....

MARKS

2

Q7 a) State what is meant by the term 'fertilisation'.

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.....

b) Describe **ONE** function of **EACH** of the following seed parts, by completing the table below:

| Seed part | Function |
|------------------|-----------------|
| Endosperm | |
| Plumule | |
| Hypocotyl | |
| Testa | |

2

2

2

2

Total Mark

Please turn over/.....

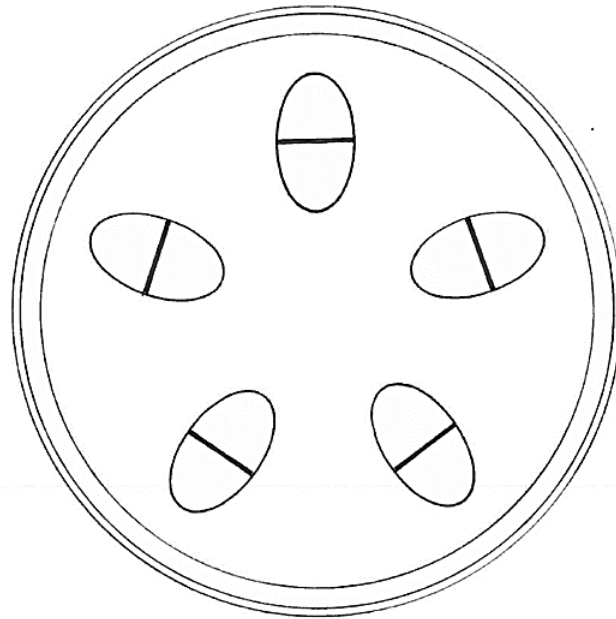
MARKS

Q8 a) Indicate where **EACH** of the following processes take place on the diagram of the young dicotyledonous stem below:

- i) cell division;
- ii) sugar transport;
- iii) starch storage;
- iv) prevention of water loss.

1
1
1
1

Cross section of a young dicotyledonous stem



b) Name the tissues where the processes listed in a) take place:

- i).....
- ii).....
- iii).....
- iv).....

1
1
1
1

c) State **TWO** differences between the stems of dicotyledonous and monocotyledonous plants.

.....
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.....

2

Total Mark

Please see over/.....

Q9 a) Describe how fruits are dispersed using **NAMED** plant examples, by completing the table below.

| Dispersal mechanism | Plant example | Description |
|---------------------|---------------|-------------|
| Wind | | |
| Explosive | | |
| Water | | |

3

3

3

b) Name **ONE** other fruit dispersal mechanism.

1

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|------------|
| Total Mark |
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Please turn over/.....

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

- i) genus;
- ii) species.

2
2

i).....
.....
.....
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ii).....
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b) Name **TWO** distinct examples for **EACH** of the following terms.

- i) genus;
- ii) species.

2
2

i).....
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ii).....
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c) State **TWO** benefits of botanical plant names compared with common names.

2

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| Total Mark |
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R2101

PLANT CLASSIFICATION, STRUCTURE & FUNCTION

Level 2

Monday 19 June 2017

| | | | | | |
|------------------------------|------------|--------|--------------------------------|------------|---------------|
| Candidates Registered | 407 | | Total Candidates Passed | 252 | 75.68% |
| Candidates Entered | 333 | 81.82% | Passed with Commendation | 130 | 39.04% |
| Candidates Absent/Withdrawn | 68 | 16.71% | Passed | 122 | 36.64% |
| Candidates Deferred | 6 | 1.47% | Failed | 81 | 24.32% |

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) State what is meant by the following botanical terms, giving a **NAMED** plant example for **EACH**, by completing the table below.

| Botanical term | Meaning of botanical term | Plant example |
|-----------------------|----------------------------------|----------------------|
| Ephemeral | | |
| Annual | | |
| Biennial | | |

2

2

2

b) State the significance of juvenile growth in **TWO NAMED** horticultural situations.

4

Q1a) Candidates who gained full marks provided concise meanings for each of the botanical terms. Ephemeral plants complete several lifecycles in a single growing season/year e.g. *Cardamine hirsuta* and *Senecio vulgaris*. Annual plants complete one life cycle in a growing season/year e.g. *Lathyrus odoratus* and *Stellaria media*. Biennial plants complete their life cycle in two growing seasons/years e.g. *Digitalis purpurea* and *Poa annua*.

It is important that plant examples are accurate for this type of question e.g. *Poa annua* is an ephemeral and *Capsella bursa-pastoris* is an annual.

Marks could not be awarded to candidates who named tender perennials/half-hardy perennials grown as annuals.

Q1b) Maximum marks were awarded to candidates who were able to state the significance of juvenile growth for specific horticultural situations. Suitable examples included:

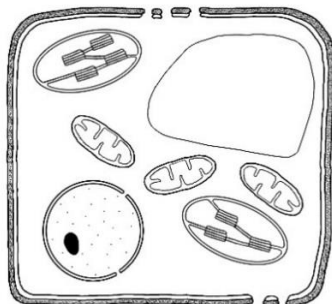
- Coppicing of *Cornus alba* in a garden border to provide brightly coloured juvenile stems for ornamental effect in winter
- Regular mowing of lawns to prevent flower development and to encourage a dense sward
- Juvenile material is used for stem cuttings which usually root more easily than flowering shoots
- Retention of leaves on hedges in winter (marcescence) is due to regular pruning which produces juvenile growth e.g. *Carpinus betulus* and *Fagus sylvatica*
- Harvesting of juvenile plants before flowering in food crops e.g. carrots and spinach

Q2 a) Label **EACH** of the following plant cell components on the diagram below:

5

- i) cell membrane;
- ii) vacuole;
- iii) cell wall;
- iv) chloroplast;
- v) nucleus.

Typical plant cell



b) State **ONE** function for **EACH** of the plant cell components listed in a).

5

Q2a) Most candidates were able to correctly and precisely label the plant cell components and were awarded full marks.

Candidates who confused the cell membrane with the cell wall and the chloroplast with the mitochondrion (the former is larger) or the cytoplasm could not be awarded any marks.

Q2b) The best candidates stated one function only of each of the plant cell components and gained full marks. Acceptable answers were:

- Cell membrane - controls the movement of substances in and out of the cell as it is selectively permeable
- Vacuole – controls cell turgor/stores waste products
- Cell wall – controls the shape of the cell/limits cell expansion
- Chloroplast – site of photosynthesis/site of chlorophyll synthesis
- Nucleus – contains genetic information so controls cell processes

MARKS

- Q3 a)** State what is meant by the term 'pollination'. **3**
- b)** Describe how **THREE** distinct **NAMED** characteristics of wind pollinated flowers assist in successful pollination. **6**
- c)** Name **ONE** plant example of a wind pollinated flower. **1**

Q3a) Many candidates gained full marks for stating that pollination is the transfer of pollen from an anther to a stigma.

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

Q3b) Candidates who gained full marks named appropriate characteristics and described how each aids successful pollen dispersal in wind pollinated flowers. Suitable answers included:

- The stigmas hang outside the flower so that other flower parts do not get in the way of the pollen
- A large amount of pollen is produced to increase the chances of pollen reaching a stigma
- Petals are dull, brown or green as there is no need to attract an insect pollinator
- Flowers open before the leaves appear so pollen dispersal is not obstructed

Q3c) Most candidates provided examples which were obvious and easy to verify e.g. grasses *Zea mays* and *Stipa gigantea* or trees *Betula pendula* and *Quercus robur* and achieved full marks.

Candidates who confused pollen dispersal with seed dispersal and gave examples of *Tilia*, *Salix*, *Acer* and *Taraxacum* could not be awarded any marks.

MARKS

- Q4 a)** *Name the site of aerobic respiration in the cell.* **1**
- b)** *Name the products of aerobic respiration.* **3**
- c)** *Describe the significance of aerobic respiration in plant propagation.* **6**

Q4a) The majority of candidates named the site of aerobic respiration in the cell correctly as a mitochondrion and gained full marks.

Q4b) Most candidates were able to name the products of aerobic respiration as carbon dioxide, water and energy (ATP and heat) and were awarded full marks.

Candidates who confused photosynthesis with respiration could not be awarded any marks.

Q4c) Candidates who were able to describe the link between the processes of aerobic respiration and plant propagation gained maximum marks. This link was in relation to propagation through vegetative organs, cuttings and/or seeds. Suitable answers included:

- Aerobic respiration is required for growth of new cells, new roots (in cuttings) and the embryo (in germinating seeds)
- Aerobic respiration breaks down starch and other substrates in the cotyledons/endosperm of seeds to release energy for growth of the embryo
- Aerobic respiration breaks down starch stored in stems and glucose produced by photosynthesis in the leaves of cuttings to release energy for growth of new roots
- Oxygen is required for aerobic respiration so a good supply is necessary in composts and/or the soil
- Seed or cutting composts and soils should be well aerated. If they are waterlogged or compacted anaerobic respiration will occur, resulting in less energy release and the production of toxic ethanol
- The rate of aerobic respiration increases with temperature and therefore supplying warmth will speed up respiration. This can be achieved by the provision of bottom heat for cuttings to promote root growth and a suitable temperature for germination of seeds

MARKS

Q5 a) Name the main function of leaves.

1

b) Identify **EACH** of the leaf adaptations (X,Y,Z) shown below, giving **ONE NAMED** plant example for **EACH**.

X



1

Name of adaptation

1

Plant example

Y



1

Name of adaptation

1

Plant example

Z



1

Name of adaptation

1

Plant example

Question 5 continues on facing page

Q5**MARKS**

c) State the function of the leaf adaptations X, Y, Z shown in b).

1

Q5a) The majority of candidates correctly named photosynthesis as the main function of leaves and gained full marks.

Q5b) Candidates who correctly identified the leaf adaptations and provided a plant example for each were awarded full marks. These were:

- X is a tendril e.g. *Pisum sativum* or *Lathyrus odoratus*
- Y is a spine e.g. *Berberis thunbergii* or *Opuntia elata*
- Z is a bulb e.g. *Narcissus* 'Tête-à-tête' or *Tulipa* 'Queen of Night'

Candidates who provided examples of stem and inflorescence tendrils instead of leaf tendrils and examples of prickles (epidermal outgrowths) and thorns (modified stems) could not be awarded any marks.

Q5c) Full marks were gained by candidates who were able to state the function of each of the leaf adaptations. Acceptable answers were:

- X Tendrils enable the plant to climb towards the light for photosynthesis or to improve their chance of pollination or seed dispersal
- Y Spines protect plants from herbivory and also reduce the leaf area to control water loss
- Bulbs are a perennating organ which store starch to be used for new growth in the spring (rather than for surviving over winter). Bulbs also enable natural vegetative spread

Q6 Describe the pathway of water movement from the soil to the stem, with the aid of a fully labelled diagram in the space below.

10

Q6) Full marks were awarded to candidates who drew a fully annotated diagram of the root in transverse or longitudinal section showing the layers of the root in the correct order and indicating the route taken by water.

Suitable answers described how water from around the soil particles passes into or around the root hair cells of the epidermis. This then crosses the cortex either between cells or from cell to cell until it reaches the endodermis. The Casparian Strip, which is a waxy layer in the endodermal cell walls blocks the passage of water between the cells, forcing it to enter the endodermal cells by osmosis. Water flow is controlled at this point. Beyond the endodermis water crosses the pericycle to enter the xylem of the root, eventually connecting with the xylem of the stem.

Descriptions of transpiration pull, osmosis, root pressure, capillary action or active transport were not required and could not be awarded any marks.

Q7 a) State what is meant by the term 'fertilisation'.

2

b) Describe **ONE** function of **EACH** of the following seed parts, by completing the table below:

| Seed part | Function | |
|------------------|-----------------|----------|
| Endosperm | | 2 |
| Plumule | | 2 |
| Hypocotyl | | 2 |
| Testa | | 2 |

Q7a) The majority of candidates correctly stated that fertilisation is the fusion of a male and female gamete to form a zygote and gained full marks.

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

Q7b) Candidates who fully described one function of the seed parts gained maximum marks. Suitable answers included:

- Endosperm – stores starch to supply energy to the embryo on germination
- Plumule – gives rise to the new shoot on germination which will photosynthesise
- Hypocotyl – raises cotyledons above the ground in epigeal germination
- Testa – protects embryo from environmental damage, pests and diseases may cause dormancy through excluding water and oxygen or containing chemical inhibitors

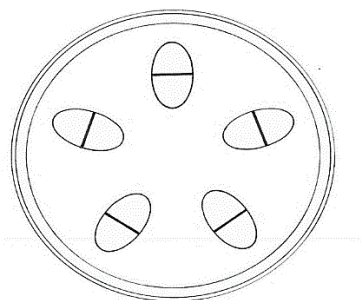
Candidates who described the structure of the seed parts could not be awarded any marks.

Q8 a) Indicate where **EACH** of the following processes take place on the diagram of the young dicotyledonous stem below:

- i) cell division;
- ii) sugar transport;
- iii) starch storage;
- iv) prevention of water loss.

1
1
1
1

Cross section of a young dicotyledonous stem



b) Name the tissues where the processes listed in a) take place:

- i)
- ii)
- iii)
- iv)

1
1
1
1

c) State **TWO** differences between the stems of dicotyledonous and monocotyledonous plants.

2

Q8a) Most candidates labelled the diagram correctly and were awarded full marks.

Q8b) The majority of candidates were able to name the tissues where the processes take place and gained maximum marks.

- i) Cell division takes place in the vascular cambium
- ii) Sugar transport takes place in the phloem
- iii) Starch storage takes place in the pith and/or the cortex
- iv) Water loss is prevented by the epidermis and/or the cuticle

Candidates who gave answers relating to cells and not tissues could not be awarded any marks.

Q8c) Candidates who were awarded full marks provided suitable differences between the stems of dicotyledonous and monocotyledonous plants. These included:

- Dicotyledonous plants have their vascular bundles arranged in a ring whereas they are scattered in monocotyledonous plants
- Dicotyledonous plants have a vascular cambium and undergo secondary thickening whereas monocotyledonous plants do not
- The stems of dicotyledonous plants are often branched whereas the stems of monocotyledonous plants are not

Candidates who described the differences in roots or leaves rather than stems could not be awarded any marks.

Q9 a) Describe how fruits are dispersed using **NAMED** plant examples, by completing the table below.

MARKS

| Dispersal mechanism | Plant example | Description |
|----------------------------|----------------------|--------------------|
| Wind | | |
| Explosive | | |
| Water | | |

3

3

3

b) Name **ONE** other fruit dispersal mechanism.

1

Q9a) Many candidates gained maximum marks for detailed descriptions how fruits are dispersed. Acceptable answers included:

- Wind dispersal includes the winged fruits/samaras of *Acer campestre* which spin like a helicopter as they are carried by the wind or the parachute-like fruits of *Taraxacum officinale* which are light enough to float on the wind
- Explosive dispersal is best illustrated by the legumes (pods) of Fabaceae e.g. *Lathyrus odoratus* which twist and split open when dry, flinging out the seeds or *Cardamine hirsuta* and *Impatiens glandulifera* which release seeds explosively in response to touch
- Water dispersal is illustrated by *Cocus nucifera* which contains spongy tissue with air spaces allowing it to float away on ocean currents

Q9b) Most candidates named animal dispersal, either internal through ingestion or external through attachment as an additional fruit dispersal mechanism and were awarded full marks.

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

- | | | |
|-----|------------------|----------|
| i) | <i>genus</i> ; | 2 |
| ii) | <i>species</i> . | 2 |

b) Name **TWO** distinct examples for **EACH** of the following terms.

- | | | |
|-----|------------------|----------|
| i) | <i>genus</i> ; | 2 |
| ii) | <i>species</i> . | 2 |

c) State **TWO** benefits of botanical plant names compared with common names. **2**

Q10a) Candidates who were able to state the meaning of the following terms achieved full marks.

- i) Genus is a subgroup of a family which contains a groups of species. The groups of species within a genus have characteristics in common.
- ii) Species is a subgroup of a genus containing individual plants. All the plants of a particular species have characteristics in common. Individuals within a species are able to interbreed.

Q10b) To gain full marks for this section of the question candidates needed to write and spell the plant names correctly. Suitable answers included:

- i) Genus e.g. *Rosa*, *Pyrus*, *Cedrus*
- ii) Species e.g. *Viburnum davidii*, *Betula pendula*, *Choisya ternata*

As the species name is the whole binomial, marks could not be awarded if candidates only provided or only underlined the specific epithet.

Q10c) The majority of candidates were able to state benefits of botanical plant names compared with common names. Acceptable answers included:

- Botanical names are used worldwide whereas common names vary from place to place
- Every plant has a unique botanical name whereas one plant may have many different common names
- The language used for the botanical name is universal whereas common names will be in different languages or a plant may not have a common name
- Botanical names can indicate a relatedness between plants where they have a common genus whereas common names do not
