



**R3101**

**PLANT TAXONOMY, STRUCTURE AND FUNCTION**

**Level 3**

**Thursday 16 February 2012**

**09:30 – 11:00**

**Written Examination**

Candidate Number:.....

Candidate Name:.....

Centre Number/Name:.....

**IMPORTANT – Please read carefully before commencing.**

- i) The duration of this paper is **90 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 in answering the questions.

## ANSWER ALL QUESTIONS

MARKS

Q1

- a) Name **FOUR** plants whose specific epithet indicates a particular colour.

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- b) i) Explain, with a **NAMED** plant example, how specific epithets can indicate the geographical origin of plants.

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- ii) Explain, with **ONE NAMED** plant example, how specific epithets may be misleading as to the country of origin of a plant.

**3**

Total Mark

a)

[illegible]

- b) Describe **TWO NAMED** conifers with horticultural merit.

4

Total Mark

**Please turn over/.....**

### Q3

Describe the structure of **TWO** supportive tissues, including their position in the plant.

**10**

**MARKS**

Total Mark

**Please turn over/.....**

**Q4** a) Label the flower parts on the photograph below.

**3**



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



- b) i) State whether the photograph of a flower in a) shows a dicotyledon or a monocotyledon.

**1**

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- ii) State **TWO** reasons for your answer.

**2**

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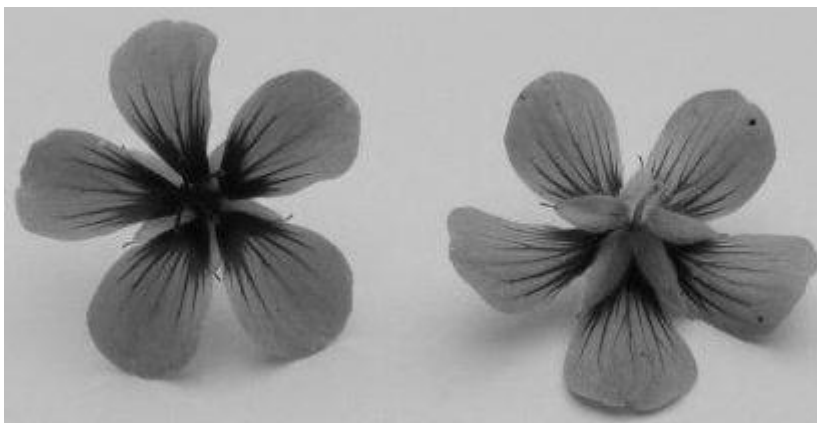
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- c) i) State whether the photograph below shows a monocotyledonous or a dicotyledonous flower.

**1**



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**MARKS**

ii) State **TWO** reasons for your answer.

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iii) State a likely pollinator of this flower.

**1**

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Total Mark

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Q5

- i) Identify **EACH** of the following types of fruit with a **NAMED** example of **EACH**:

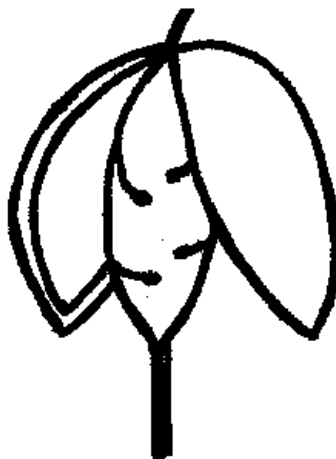
10



Fruit type:.....

Example:.....

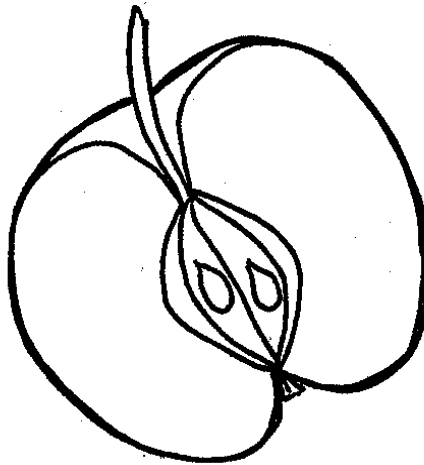
ii)



Fruit type:.....

Example:.....

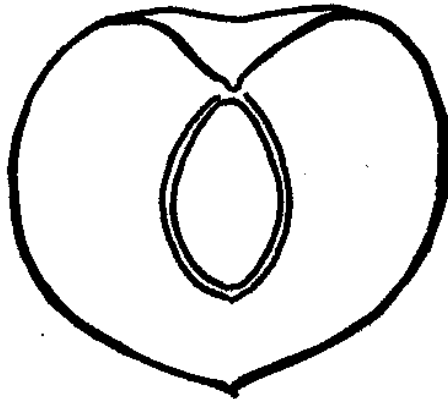
iii)



Fruit type:.....

Example:.....

iv)

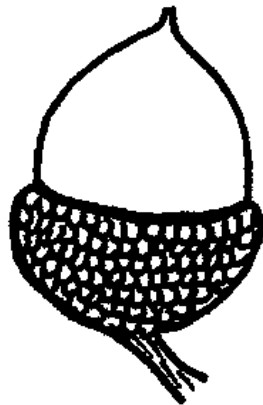


Fruit Type:.....

Example:.....

Please see over/.....

v)



Fruit Type:.....

Example:.....

Total Mark

Please turn over/.....

- i) light intensity;
- ii) light quality;
- iii) water stress;
- iv) nutritional status;
- v) carbon dioxide concentration.

10

**MARKS**

Total Mark

**Please turn over/.....**

1

[illegible]

1

**5**

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d) Describe the mechanism of the movement of water in guttation.

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Total Mark
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[illegible]

- i) thermonasty;
- ii) photonasty.

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3

[illegible]

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- c) Describe **ONE** possible advantage to the plant of a nastic response. **2**

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Total Mark
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**Please turn over/.....**

10

**MARKS**

Total Mark

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**Q10**

a) Label the diagram below of a secondarily thickened stem.

**8**

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**MARKS**

b) Identify **FOUR** tissue layers that make up bark.

**2**

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Total Mark

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## RHS LEVEL 3 CERTIFICATE IN THE PRINCIPLES OF PLANT GROWTH, HEALTH AND APPLIED PROPAGATION WRITTEN EXAMINATION

**09:30am Thursday 16 February 2012**

**R3101**

### PLANT TAXONOMY, STRUCTURE & FUNCTION

<b>Candidates Registered</b>	<b>183</b>		<b>Total Candidates Passed</b>	<b>96</b>	<b>65.75%</b>
Candidates Entered	146	79.78%	Passed with Commendation	27	18.49%
Candidates Absent	26	14.21%	Passed	69	47.26%
Candidates Deferred	8	4.37%	Failed	50	34.25%
Candidates Withdrawn	3	1.64%			

- Q1**
- a) Name **FOUR** plants whose specific epithet indicates a particular colour.
  - b) i) Explain, with a **NAMED** plant example, how specific epithets can indicate the geographical origin of plants.
  - b) ii) Explain, with **ONE NAMED** plant example, how specific epithets may be misleading as to the country of origin of a plant.

Candidates were usually able to give the names of four plants e.g. *Helleborus niger*, *Digitalis purpurea*, where the specific epithet referred to a particular colour. Some lost marks by quoting cultivars or varieties e.g. *Cedrus atlantica* *Glauc* group.

The second part of the question was usually done very well with reference to *Wisteria sinensis*, *Camellia japonica* etc. References to geographical features, e.g. mountains or maritime areas were accepted.

The third part caused problems for many. Reference should have been made to e.g. *Prunus persica* where the specific epithet indicates Iran but the plant is from China, an error due to plants reaching Europe via Iran.

**Q2** a) Describe the characteristics of coniferous plants.

b) Describe **TWO NAMED** conifers with horticultural merit.

The characteristics of conifers were extremely well known by the majority of candidates. However, in the second part of the question descriptions of two conifers were often poor, sometimes just repeating the characteristics of conifers, and without any appreciation of their horticultural merit. Mention could have been made of height/spread, habit, colour of foliage, evergreen/ deciduous (autumn colour), impact of cones and uses in a garden context amongst others. To say that *Pinus sylvestris* is tall and has needles is not a good description. Candidates had problems with the name of *X Cuprocyparis leylandii* ( *X Cupressocyparis leylandii*).

**Q3** Describe the structure of **TWO** supportive tissues, including their position in the plant.

Collenchyma and sclerenchyma were the expected two tissues and were usually done well. However, candidates also offered xylem (allowed), parenchyma (allowed as long as there was a reference to turgor) and phloem (not allowed).

**Q4** a) Label the flower parts on the photograph below.

b) i) State whether the photograph of a flower in a) shows a dicotyledon or a monocotyledon.

b) ii) State **TWO** reasons for your answer.

c) i) State whether the photograph below shows a monocotyledonous or a dicotyledonous flower.

c) ii) State **TWO** reasons for your answer.

c) iii) State a likely pollinator of this flower.

Candidates experienced very little difficulty with this question. However, the great majority failed to label the perianth segments of the lily as tepals and subsequently failed to indicate that one of the differences between monocotyledons and dicotyledons was that the two whorls of perianth segments are indistinguishable (usually) in monocotyledons and distinguishable as petals and sepals in dicotyledons. A minority gave as one of the reasons that the lily is a monocotyledon is because it is wind-pollinated, with reference to the protruding stamens and stigma.

**Q5** i) Identify **EACH** of the following types of fruit with a **NAMED** example of **EACH**:

ii) Fruit type:.....

Example:.....

iii) Fruit type:.....

Example:.....

iv) Fruit type:.....

Example:.....

v) Fruit type:.....

Example:.....

- i) (achene of Clematis)
- ii) (siliqua of Alyssum)
- iii) (pome of Malus)
- iv) (drupe of Prunus)
- v) (nut of Quercus)

The first diagram of an achene from Clematis vitalba and the second diagram of a siliqua from Alyssum spinosum gave most difficulty. Any example of the type of fruit shown was acceptable e.g. Capsella bursa-pastoris or Lunaria annua for the siliqua but no marks were given for an example without the type of fruit being named first.

**Q6** Describe how **EACH** of the following can affect the rate of photosynthesis in protected structures:

- i) light intensity;
- ii) light quality;
- iii) water stress;
- iv) nutritional status;
- v) carbon dioxide concentration.

The main problem experienced by candidates was keeping to the question which was about the effect of various factors on the RATE of photosynthesis. Light intensity should have included the possibility of damage at high levels reducing the rate or the saturation of the photosynthetic apparatus limiting the rate or the overall effect in low light of falling below the compensation point. Water stress proved the most difficult of the five factors. Most candidates were aware of the closure of stomata in periods of water stress. Those who mentioned wilting then did not usually go on to mention that leaves were no longer held in the best position for photosynthesis. No student was aware that in a wilted plant the stomata gape open once the epidermis has lost turgor. Too many students considered that in a tissue that is roughly 90% water, in periods of water stress water would be unavailable for the photolysis reaction.

- Q7**
- a) State what is meant by 'guttation'.
  - b) State the environmental conditions that encourage guttation.
  - c) Describe the pathway that water follows from the soil through the plant before being lost from the leaves.
  - d) Describe the mechanism of the movement of water in guttation.

The fact of guttation was known by most candidates as was the high humidity conditions that encourage it. However the mechanism, requested in the third part of the question, was not well known. Reference should have been made to root pressure caused by the active transport of ions into the stele, reducing water potential so that water is drawn in and pushed up the xylem. The pathway that water follows in the plant was usually done well although there was usually some confusion over the part of the pathway where the suberised casparian strip in the endodermal walls blocks the apoplast pathway so that water is forced to enter the symplast route.

- Q8** a) State what is meant by a nastic response.
- b) Describe the following nastic responses using **ONE NAMED** plant example for **EACH**:
- i) thermonasty;
  - ii) photonasty.

- c) Describe **ONE** possible advantage to the plant of a nastic response.

There is still some confusion among candidates between tropisms and nastic movements. However, the first two parts of the question were usually done well although the mechanism of thermonasty/photonasty (differential growth in tepals/turgor changes) was usually omitted. The positive value of flowers opening when pollinators are active was usually known but seldom was a possible reason for closure at other times given (e.g. protecting pollen from rain).

- Q9** Describe **FOUR** functions of auxin in plants.

The functions of auxins in tropisms and apical dominance was well known although very few mentioned the polar transport of auxins in the latter. Other possible functions included: growth in length of stems/cells, abscission of leaves and fruits, pericarp growth, xylem differentiation, adventitious root initiation and the promoting of femaleness in some flowers. Since the question stated 'in plants' references to externally applied synthetic auxins did not gain marks.

- Q10** a) Label the diagram below of a secondarily thickened stem.
- b) Identify **FOUR** tissue layers that make up bark.

Most candidates were able to answer this question very well. Sometimes primary xylem and primary phloem were not labelled, the cortex was often missed and trouble was sometimes experienced labelling the various layers of the periderm (in particular, phellem was often mis-labelled bark). However, in the case of the latter, even if not adequately labelled on the diagram, the components of bark were usually able to be accurately stated in the second part of the question.

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