



R3101

PLANT TAXONOMY, STRUCTURE & FUNCTION

Level 3

Thursday 17 February 2011

09:30 – 10:45

Written Examination

Candidate Number:.....

Candidate Name:.....

Centre Number/Name:.....

IMPORTANT – Please read carefully before commencing:

- i) The duration of this paper is **75 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

Q1 a) Explain the difference between aerobic and anaerobic respiration, giving equations for **EACH** process.

6

Please see over/.....

b) Describe **ONE** advantage and **ONE** limitation of anaerobic respiration.

2

[illegible]

c) Describe **TWO** horticultural situations where anaerobic respiration may develop.

2

Please turn over/.....

Q2 a) Draw and label a diagram of a transverse section (cross section) of a young dicotyledonous root.

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b) Explain the relevance of the Casparian strip to water and solute movement across the root.

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- Q3** a) State **FOUR** reasons for the correct usage of botanical and horticultural nomenclature.

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- b) Give a **NAMED** plant example for **EACH** of the following:

- i) genus;
- ii) species;
- iii) variety;
- iv) cultivar;
- v) trade designation;
- vi) graft hybrid.

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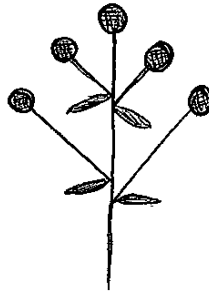
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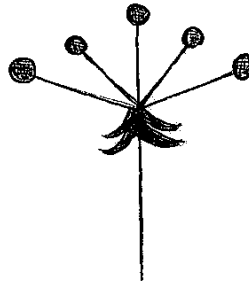
- Q4** a) Identify **EACH** of the following types of inflorescence and give a **NAMED** example of **EACH**:

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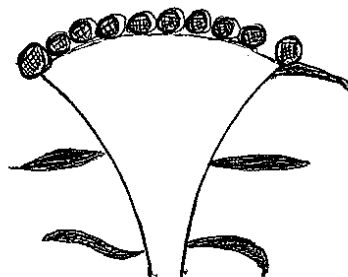
Type of Inflorescence:.....

Named example:.....



Type of Inflorescence:.....

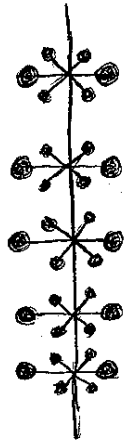
Named example:.....



Type of Inflorescence:.....

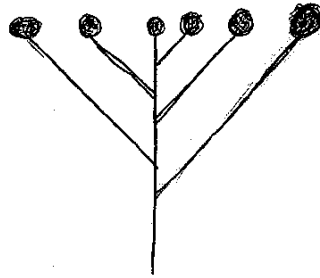
Named example:.....

Please see over/.....



Type of Inflorescence:.....

Named example:.....



Type of Inflorescence:.....

Named example:.....

Q5 a) Distinguish between tropism and nastic movement.

2

[illegible]

b) Explain, for **EACH** of the following plant responses, the type of movement involved:

- i) seismonasty/thigmonasty;
- ii) geotropism.

3

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c) Give **TWO** examples of how tropisms influence horticultural practice.

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Please see over/.....

Q6

Describe and state the function within the plant, of **EACH** of the following:

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i) parenchyma;

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ii) collenchyma;

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iii) phellem (cork);

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Please turn over/.....

iv) vascular cambium;

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v) sclereids.

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Q7 a) State the main function of **EACH** of the following endogenous growth regulators:

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i) gibberellin;

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ii) cytokinins;

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iii) abscisic acid.

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Please turn over/.....

- b) Describe the use of a **NAMED** synthetic growth regulator in a specific horticultural situation.

4

Please see over/.....

Q8

Describe the processes taking place during the light and dark reactions of photosynthesis.

10

Please turn over/.....

Q9

Describe, using a **NAMED** example in **EACH** case, the adaptation of a flower for pollination by **EACH** of the following:

- i) bee;
- ii) butterfly.

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Please see over/.....

Q10 a) Name **ONE** plant of horticultural importance that produces pomes.

1

b) Describe the role of a pome in the life of the plant.

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

09:30am Thursday 17th February 2011

R3101

PLANT TAXONOMY, STRUCTURE & FUNCTION

Candidates Registered	148		Total Candidates Passed	51	40.16%
Candidates Entered	127	85.81%	Passed with Commendation	9	7.09%
Candidates Absent	16	10.81%	Passed	42	33.07%
Candidates Deferred	2	1.35%	Failed	76	59.84%
Candidates Withdrawn	3	2.03%			

- Q1**
- a) Explain the difference between aerobic and anaerobic respiration, giving equations for **EACH** process.
 - b) Describe **ONE** advantage and **ONE** limitation of anaerobic respiration.
 - c) Describe **TWO** horticultural situations where anaerobic respiration may develop.

The differences between aerobic and anaerobic respiration, and their respective energy yields, were well known. Difficulty was experienced in producing a correct, balanced equation for anaerobic respiration. Advantages and limitations were also usually understood but difficulty was experienced with describing horticultural situations that may give rise to anaerobic respiration. The response 'waterlogged soil' is not sufficient on its own to gain full credit. Reference needed to be made to water occupying the pores of the soil that would normally contain air and therefore be able to supply oxygen. Other acceptable situations would include 'overwatering of media', 'compaction of soil', 'capping of soil', 'storage of produce' etc. but each answer would need to include an explanation of why that situation could lead to anaerobic respiration developing.

- Q2**
- a) Draw and label a diagram of a transverse section (cross section) of a young dicotyledonous root.
 - b) Explain the relevance of the Casparian strip to water and solute movement across the root.

The diagram of a root was usually done well. However, the casparian strip was often stated to control the movement of water from soil to stele. Its function rather is to interrupt the apoplastic movement of soil solution to ensure control of the solutes entering the stele. Most candidates did not understand that the casparian strip is actually in the cell wall of the endodermal cells.

- Q3**
- a) State **FOUR** reasons for the correct usage of botanical and horticultural nomenclature.
 - b) Give a **NAMED** plant example for **EACH** of the following:
 - i) genus;
 - ii) species;
 - iii) variety;
 - iv) cultivar;
 - v) trade designation;
 - vi) graft hybrid.

It was generally understood by candidates that the correct usage of nomenclature ensures accurate communication about a specific plant within and across national frontiers. Very few indicated that it has some predictive value for plant diseases etc. and it makes specification for planting schemes much more accurate than it could otherwise be.

Many students do not understand that a requested plant example should have a full name (apart from in b) i)). Thus many answers gave a specific epithet for the species or just a cultivar name for a cultivar. The point is that *Geranium pratense* 'Mrs Kendall Clarke' refers to a specific group of plants while 'Mrs Kendall Clarke' on its own is meaningless. Many students gave *Choisya ternata* Sundance 'Lich' as an example of a trade designation. However *C. ternata* Sundance is the trade designation while *C. ternata* 'Lich' is the cultivar. Giving both could not earn credit and in fact there was widespread confusion in answers between these two categories.

Q4 Identify **EACH** of the following types of inflorescence and give a **NAMED** example of **EACH**:

This question was usually answered well. Common errors were to give 'spike' rather than 'verticillaster' for the fourth example and to give an *Achillea* as an example of a corymb. The individual units of an *Achillea* inflorescence are capitula and not individual flowers. Acceptable examples of a corymb would be *Hydrangea macrophylla* and *Cotoneaster salicifolium*.

- Q5**
- a) Distinguish between tropism and nastic movement.
 - b) Explain, for **EACH** of the following plant responses, the type of movement involved:
 - i) seismonasty/thigmonasty;
 - ii) geotropism.
 - c) Give **TWO** examples of how tropisms influence horticultural practice.

In the definition of a tropism, it should be emphasised that the stimulus is uni-directional and that the response is by growth. A nastic movement is a growth or turgor response to a non-directional stimulus. In the second part of the question, a brief explanation of each type of movement was sought. So in describing the response of *Mimosa pudica* to touch, the collapse of the leaflets/ leaves should be noted and it should be further stated that this is due to the loss of turgor of cells at the base of the leaflets/leaves.

Horticultural practice resulting from an awareness of tropisms was not usually done well but could have included reference to ensuring even illumination when growing plants in a protected situation to avoid the adverse effects of positive phototropism, storing cut flowers e.g. *Gladiolus* cvs. upright to avoid the effects of negative geotropism and providing an appropriate means of support for climbing plants.

Q6 Describe and state the function within the plant, of **EACH** of the following:

- i) parenchyma;
- ii) collenchyma;
- iii) phellem (cork);
- iv) vascular cambium;
- v) sclereids.

This was a straightforward question but not usually answered well. In particular, the structure and function of a sclereid was not known by the majority of candidates. They are very variable in shape, but not usually elongated like fibres, and have very thick, lignified secondary walls. They are found in e.g. the stony endocarps of drupes where they are protective of the enclosed seeds.

Q7 a) State the main function of **EACH** of the following endogenous growth regulators:

- i) gibberellin;
- ii) cytokinins;
- iii) abscisic acid.

b) Describe the use of a **NAMED** synthetic growth regulator in a specific horticultural situation.

The main function of each of the endogenous growth regulators was required but too often these were not known by candidates and many answers were confused. The main functions expected were for gibberellins the promotion of stem internodal elongation and seed germination, for cytokinins the promotion of cell division and the delaying of senescence and for abscisic acid the promotion of seed dormancy and the closure of stomata in the stress response to drought. Any other accepted function was given credit but it is no longer accepted that abscisic acid has a role in bud dormancy.

Very few candidates could name the active ingredient of a synthetic growth regulator, many answers confining themselves to 'auxins' or 'hormone rooting powder'. Further detail was not usually forthcoming. The sort of answer expected would be e.g. that paclobutrazol (Bonzi) is used on bedding plants in plugs/containers to induce dwarfness and increase branching. In addition the stage of growth when it is applied and/or the dosage should be stated.

Q8 Describe the processes taking place during the light and dark reactions of photosynthesis.

This question required candidates to give descriptions of the light and dark reactions of photosynthesis. It is not required that biochemical reactions are given but some detail should be known. Thus, for the light reaction, it should be known that PAR received by the chloroplast, excites electrons in the chlorophyll molecule and when these decay to the ground state ATP and reduced NADP (Nicotinamide adenine dinucleotide phosphate) are produced. This occurs in the grana of the chloroplast. The hydrogen ions for the reduction are derived from the photolysis of water, releasing oxygen. Further details of photophosphorylation are not required.

Q9 Describe, using a **NAMED** example in **EACH** case, the adaptation of a flower for pollination by **EACH** of the following:

- i) bee;
- ii) butterfly.

Answers to this question often lacked detail, providing instead generalisations like 'bright colours', 'provides pollen', and 'scented'. The level of detail required for a butterfly flower like *Buddleja davidii* is that the small flowers are massed to form a highly visible landing area, the flowers are usually lavender or pink in colour, with plentiful nectar, are day-scented and are tubular to fit the butterfly's proboscis.

Q10 a) Name **ONE** plant of horticultural importance that produces pomes.
b) Describe the role of a pome in the life of the plant.
c) Describe, with the aid of a clearly labelled diagram, the structure of a pome.

Most candidates named a *Malus* variety as their example although *Chaenomeles*, *Sorbus*, *Cotoneaster* or *Pyracantha* among others would have been acceptable. The role of the pome in attracting animals to assist in the dispersion of seeds was understood by many candidates. Very few, however, knew that the fleshy part of a pome is part receptacle and part pericarp while the core is the endocarp. Diagrams were not usually well done.

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