Including examiner comments

R3104

UNDERSTANDING APPLIED PLANT PROPAGATION

Level 3

Wednesday 7 February 2024

15:55 – 16:45

Written Examination

Candidate Number: .....

Candidate Name: .....

Centre 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. 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 State the parameters involved with the conservation of UK native plant species stored in seed banks under **EACH** of the following headings:

i) collection and selection of seeds for storage **3**
ii) preparation of a suitable seed sample for storage **4**
iii) conditions inside the store **3**

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MARKS

Q2 For **EACH** of **FOUR** propagation facilities listed state:

i) a suitable vegetative propagation technique for a **NAMED** plant which **EACH** can be used for
ii) **ONE** reason for using **EACH** facility for this purpose

by completing the table below:

Propagation Facility	**Suitable vegetative propagation technique**	**Named plant**	**Reason for use**	
Cold Frame				**2.5**
Mist Unit				**2.5**
Heated propagator				**2.5**
Low Polythene Tunnel				**2.5**

Total Mark

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MARKS

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MARKS

Q3 Describe the production of **ONE NAMED** chip budded ornamental tree under **EACH** of the following headings:

i) rootstock selection **4**
ii) budding technique (outline only) **4**
iii) containerisation **1**

NAMED ornamental tree **1**

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MARKS

Q4 a) Define the term seed dormancy. **2**

b) State **TWO** functions of seed dormancy. **2**

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c) Name **THREE** endogenous plant growth regulators that have a role in seed dormancy and specify the role of **EACH** by completing the table below:

MARKS

6

Plant growth regulator	**Role in seed dormancy**
1.	
2.	
3.	

2

2

2

Total Mark

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General Comments

Candidates varied in their answers to this paper; some presented answers with well organised relevant and technically detailed information while others gave a lack of detail in answer to the questions, especially Question 3 on chip budding and a lack of knowledge, on occasion on specific topics.

Q1		Question	MARKS
		State the parameters involved with the conservation of UK native plant species stored in seed banks under **EACH** of the following headings;	
		i) Collection and selection of seeds for storage	**3**
		ii) Preparation of a suitable seed sample for storage	**4**
		iii) Conditions inside the store	**3**

Q1i) The majority of candidates correctly stated that the seeds selected for storage should be true to type, healthy, at the correct stage of ripeness and from endangered habitats. The seeds should be collected from sites of known provenance and a range of sites to provide genetic variability. This will provide a source of seed for regeneration and preservation and material for research and conservation.

Q1ii) To achieve full marks for this section of the question candidates were expected to provide details of the preparation of a suitable seed sample for storage. This would include cleaning the seed, i.e. removal of any debris and the husk, removal of any damaged or diseased seed and the removal of any fleshy material covering the seed by maceration and drying if appropriate. Viability tests would be carried out in laboratory conditions to ensure that the seed sample was suitable for storage.

Q1iii) UK native plant species stored in seed banks require suitable conditions inside the store. These include the store being temperature controlled, -20ºC, vermin proof, sterile, secure and with a low humidity of 4-10%. Cryo-storage which uses liquid nitrogen at a temperature of -196ºC is often used for recalcitrant seeds.

			MARKS
Q2		**Question** For **EACH** of **FOUR** propagation facilities listed state: i) a suitable vegetative propagation technique for a **NAMED** plant which **EACH** can be used for ii) **ONE** reason for using **EACH** facility for this purpose By completing the table below:	**10**

Propagation Facility	**Suitable vegetative propagation technique**	**Named plant**	**Reason for use**
Cold Frame			
Mist Unit			
Heated propagator			
Low Polythene Tunnel			

Q2 i) Most candidates had a good knowledge of suitable vegetative propagation techniques for specific propagation facilities and their reason for use which could include economic/commercial reasons. Correct scientific names for plants were also provided by many candidates. For example:

i) A Cold Frame can be used for hardwood cuttings of *Cornus alba* 'Sibirica' as it provides protection throughout the rooting process to avoid desiccation.

ii) A Mist Unit can be used for softwood cuttings of *Penstemon* 'Sour Grapes' as it provides constant atmospheric humidity and moisture to maintain the turgidity of the propagules.

iii) A Heated Propagator can be used for root cuttings of *Romneya coulteri* as it provides basal heat which can be controlled by a thermostat.

iv) A Low Polythene Tunnel can be used for semi-ripe cuttings of *Salvia rosmarinus* as it can warm the soil and provide a humid atmosphere to aid rooting.

Candidates who provided examples of seed propagation techniques could not be awarded any marks.

			MARKS
Q3	**a)**	**Question** Describe the production of **ONE NAMED** chip budded ornamental tree under **EACH** of the following headings: Named ornamental tree i) rootstock selection ii) budding technique (outline only) iii)containerisation.	 **1** **4** **4** **1**

Q3) A range of appropriately named chip budded ornamental trees were provided by candidates who were awarded marks. These included:

Sorbus aria 'Lutescens', *Malus* 'John Downie', *Prunus subhirtella* 'Autumnalis'

Q3i) Candidates who had a good knowledge of the technique of chip budding named a suitable rootstock e.g. *Sorbus aria, Acer platanoides* which must be compatible with the named cultivar, true to type, healthy, virus and pest and disease free with a diameter of 7-12mm at the budding zone. Also selected for its influence on the height and vigour of the resulting tree.

Q3ii) Good descriptions of the budding technique included the preparation of the rootstock. This included the height of budding on the rootstock i.e. 150-300mm, the creation of a lip by making an angled downwards cut into the rootstock. A second cut is made 25-30mm above this cut down to the lip to expose the cambium.

The bud chip is prepared by taking a budstick and making a lip as on the rootstock and then making a second cut 12mm above a bud and drawing the knife behind the bud to meet the lip and exposing the cambium. The length of the scion bud must match the cut on the rootstock to ensure cambium to cambium contact i.e. 25-30mm.

The bud chip is placed on the rootstock behind the lip and is tied in using clear polythene tape.

Candidates who described 'T' budding could not be awarded any marks.

Q3iii) Candidates were expected to provide details of the containerisation of the chip budded tree to gain marks. These included; size of container, 3 - 5 litre, type of growing media to be used, John Innes No 3.- peat free, method of containerisation i.e. placing tree central in the container, upright, backfilling the growing media, firming and final level of growing media on completion of containerisation.

Q4	**a)**	**Question** **Define the term seed dormancy**	**2**

	b)	**STATE TWO functions of seed dormancy**	**2**
	c)	Name **THREE** endogenous plant growth regulators that have a role in seed dormancy and specify the role of **EACH** by completing the table below:	

Plant growth regulator	**Role in seed dormancy**	
1.		**2**
2.		**2**
3.		**2**

Q4a) Candidates who clearly understood the meaning of the term seed dormancy as 'the state when seeds do not germinate despite environmental conditions for germination being favourable' were awarded marks.

Q4b) A range of functions of seed dormancy were provided by candidates who were credited with marks. These included:

- dormancy enables the seed to survive adverse environmental conditions
- dormancy has a positive role in seed dispersal
- seed dormancy enables seeds to overcome periods that are unfavourable for germination.

Q4c) Most candidates were able to name suitable endogenous plant growth regulators and specify their role in seed dormancy. Acceptable examples included:

- Abscisic acid - induces seed dormancy
- Cytokinin - is involved with ethylene insensitivity in seeds resulting in a greater proportion of mature seeds exhibiting dormancy
- Gibberellic acid – breaks seed dormancy

Candidates who named auxin, ethylene and hydrogen cyanide with their appropriate roles in seed dormancy were also credited with marks.

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