R2104

UNDERSTANDING PLANT PROPAGATION

Level 2

Monday 24 June 2019

14:50 – 15:40

Written Examination

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

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

Centre Number/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 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.
# ANSWER ALL QUESTIONS

**Q1** Describe the preparation and storage of *Phaseolus vulgaris* seed under EACH of the following headings:

<table>
<thead>
<tr>
<th>Heading</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>i) harvesting</td>
<td>4</td>
</tr>
<tr>
<td>ii) separation and cleaning</td>
<td>4</td>
</tr>
<tr>
<td>iii) storage and packaging</td>
<td>2</td>
</tr>
</tbody>
</table>

Please see over/.....

Total Mark
Q2 a) State **FOUR distinct** horticultural situations in which seed can be used.

b) Describe **THREE** methods of avoiding diseases when sowing seed.
Q3 Describe the propagation of *Lactuca sativa* in a glasshouse, under EACH of the following headings:

i) selection of container and growing media

ii) preparation of container with growing media for sowing

iii) sowing method

iv) immediate aftercare

Total Mark
Q4 a) Describe what is meant by the term ‘clone’.

b) State **FOUR** horticultural benefits of raising plants by vegetative means.

c) State **FOUR** horticultural limitations of raising plants by vegetative means.
Q5 Describe the propagation of a NAMED plant by simple layering under the following headings:

i) name of plant
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ii) time of year
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iii) selection of material
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iv) propagation method
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Please see over/.....
Q6 a) Name **THREE** types of commercial propagation facility used to grow plants.

b) Describe how to manage the environment of **ONE** of the propagation facilities named in a), to encourage the rooting process.

c) State the aftercare of vegetatively propagated plants after removal from the propagation facility.
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<table>
<thead>
<tr>
<th>Category</th>
<th>Registered</th>
<th>Entered</th>
<th>Total Passed</th>
<th>Passed with Commendation</th>
<th>Passed</th>
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<td>671</td>
<td>611</td>
<td>428</td>
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<td>Candidates Absent/Withdrawn</td>
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<td>Candidates Deferred</td>
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<td>1%</td>
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</table>

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.
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.

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.

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.

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.

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.

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 Describe the preparation and storage of Phaseolus vulgaris seed under EACH of the following headings:

i) harvesting
ii) separation and cleaning
iii) storage and packaging

Q1) Most candidates provided suitable descriptions of the preparation and storage of Phaseolus vulgaris and achieved maximum marks. These included:

i) **Harvesting**
   - Harvesting seeds from plants that are true to type, pest and disease free and undamaged
   - Harvesting pods that are ripe which is indicated by the pods turning brown on the plant. This normally occurs during late summer or early autumn
   - The pods should contain fully formed seeds
   - Harvest seeds in dry weather
   - If the pods are harvested in wet weather hang them up in bunches in a dry location e.g. greenhouse/dry building until the pods become brittle

ii) **Separation and cleaning**

   Phaseolus vulgaris seed is dry and orthodox and therefore does not require washing or soaking in water
   
   - Carefully separate the seeds from the pods and retain only those that are fully ripe and undamaged
   - Grade the seeds and reject those that are too small
   - Avoid damage when separating the seeds from the pod
   - Dry any damp seeds on paper for 7-10 days
   - Check for any evidence of disease lesions on the seed coat

iii) **Storage and packing**
   - Seeds are stored in frost free, cool dry conditions
   - Seeds can be stored in a dry envelope or paper bag
   - When fully dry seeds can be stored in a plastic box which contains silica gel
   - Long term storage can take place in a refrigerator in sealed containers
Q2 a) State **FOUR distinct** horticultural situations in which seed can be used.

b) Describe **THREE** methods of avoiding diseases when sowing seed.

**Q2a)** Marks were awarded to candidates who provided a range of situations in which seed can be used. Acceptable answers included:

Vegetable production, lawn establishment, hardy annual borders, seasonal bedding production, production of herbs, production of glasshouse food/salad crops, production of trees, shrubs, alpines and herbaceous perennials from seed, wildflower meadows and green manure crops.

**Q2b)** Maximum marks were awarded to candidates who provided detailed descriptions of suitable methods of avoiding diseases when sowing seed. These included:

- Use clean mains water rather than stored water from a water butt
- Use sterile containers that are new or have been washed and are free from debris
- Use fresh sterile growing media
- Sow seeds at a suitable density which is not too thick
- Use a weed free seed bed to avoid alternative hosts for pathogens
- Avoid wet, waterlogged soil conditions
- Use disease free quality seed which has been purchased from a reputable source
Q3. Describe the propagation of *Lactuca sativa* in a glasshouse, under **EACH** of the following headings:

i) selection of container and growing media  
ii) preparation of container with growing media for sowing  
iii) sowing method  
iv) immediate aftercare

**Q3)** Candidates who were able to describe the propagation of *Lactuca sativa* in a glasshouse gained full marks. Suitable answers included:

i) **Selection of container and growing media**  
   A clean or new, undamaged full or half seed tray or half pot using John Innes (JI) seed compost or any suitable loam-less, multi-purpose or seed sowing growing media.

ii) **Preparation of container with growing media for sowing**  
   Overfill the container with growing media, tap down, saw/strike off the growing media level using a striker board and firm using a firming board.

iii) **Sowing method**  
   Sow the seeds broadcast, either by having the seed in the palm of the hand and tapping, by pinching or by tapping them from the seed packet. Seed must be sown at the correct density i.e. 2-3mm apart. Seeds are covered to a uniform depth of 3-5mm until they just disappear from sight using sieved growing media or vermiculite. The seed tray can be watered prior to sowing.

iv) **Immediate aftercare**  
   The seed can either be watered using a watering can with a fine rose or by soaking the trays from below. The seed trays are placed in a warm environment at a temperature of 12-15°C. The trays can be covered with a sheet of glass until germination takes place to keep the seeds moist.
Q4  a) Describe what is meant by the term 'clone'.

b) State FOUR horticultural benefits of raising plants by vegetative means.

c) State FOUR horticultural limitations of raising plants by vegetative means.

Q4a) The best candidates described a clone as an individual or group of plants derived from a vegetative single source which makes them genetically identical and achieved full marks.

Q4b) The majority of candidates provided a suitable range of horticultural benefits of raising plants by vegetative means and received maximum marks. These included:

- Genetically identical plant material can be produced by vegetative means which provides a uniform performance between progeny
- Complex seed dormancy problems can be avoided
- Only method available to propagate some plants which are sterile
- Size of the plant can be controlled by the use of budding and grafting
- Shorter time for plants to reach maturity as larger pieces of plant material are used at the time of propagation e.g. cuttings, grafting, layering
- There is no requirement for pollination to take place to produce new plants

Q4c) Most candidates were awarded full marks for stating a suitable range of limitations of raising plants by vegetative means. These included:

- Limited availability of plant material
- Plants may be susceptible to pests and diseases due to a lack of genetic variation
- Requirement of a high level of skill for some methods of vegetative propagation e.g. grafting
- Specialist propagation environments are required for some methods of vegetative propagation e.g. mist unit
- Some methods of vegetative propagation require a large amount of space e.g. layering
- All propagation material suitable for vegetative propagation needs to be juvenile and non-flowering
Describe the propagation of a NAMED plant by simple layering under the following headings:

i) name of plant  
ii) time of year  
iii) selection of material  
iv) propagation method

Candidates who were able to provide good descriptions of the propagation of plants by simple layering gained full marks. Acceptable answers included:

i) **Name of plant**
   e.g. *Cornus alba*, *Cotinus coggyria*, *Magnolia x soulangeana*.

ii) **Time of year**
   Autumn, dormant season. Spring for some subjects.

iii) **Selection of material**
   True to type and pest and disease free. Young, pliable but woody and of the current or immediate previous seasons’ growth which is vegetative and non-flowering.

iv) **Propagation method**
   The soil surrounding the mother/stock plant should be well prepared and weed free, friable and ameliorated with organic matter. A shallow trench 10cm deep should be dug 40-60cm from the plant (depending on the length of the stem) or the stem can be bent into a container filled with suitable growing media.

   The stem can be wounded either by removing a section of bark from the stem and dusting it with hormone rooting powder or by twisting a wire tightly around the stem to concentrate the auxin at that point to encourage rooting.

   The selected stem is bent down into the trench creating an acute bend to hold the layer in place. A peg or wire is used to hold the stem in place and supported in a vertical position by tying it to a bamboo cane.

   Soil is backfilled into the trench where the layer is pegged down, firmed and watered.
Q6 a) Name THREE types of commercial propagation facility used to grow plants.

b) Describe how to manage the environment of ONE of the propagation facilities named in a), to encourage the rooting process.

c) State the aftercare of vegetatively propagated plants after removal from the propagation facility.

Q6a) A range of suitable types of commercial propagation facility used to grow plants were named by the best candidates who achieved maximum marks. These included:

- Closed case or dew point cabinet with bottom heat
- Polythene tent with bottom heat
- Mist propagation unit
- Fogging unit
- North wall cold frame
- Low polythene tunnel outdoors
- A heated or unheated greenhouse
- Growing room for tissue culture

Q6b) Candidates who understood the operation of the propagation facilities gained full marks. Acceptable answers included:

**Closed case and polythene tent**
Ensure that the facilities are clean. The appropriate moisture levels are maintained by the use of mist nozzles while excessive moisture is removed by ventilation. Bottom heat is controlled thermostatically and shading is used to reduce light levels and therefore temperature.

**Mist unit and fogging unit**
Ensure that the facilities and sensors are clean. The bottom heat is controlled thermostatically and it is important to check the settings and control of the mist and fogging nozzles.

**Cold frame and outdoor polythene tunnel**
Ensure that the facilities are clean and the growing media is weed free. The soil can be ameliorated with grit or a suitable growing media to improve drainage and aeration.

Q6c) The majority of candidates were able to provide details of the aftercare required by vegetatively propagated plants and were awarded full marks. Suitable answers included:

- Weaning plants from the propagation environment
- Removal of dead or diseased material
- Foliar feeding if required
- Hardening off plants
- Potting off the plants if required
- Use of crop protection measures if required
- Watering (close attention required)