R2103
MAINTAINING PLANT HEALTH
Level 2
Monday 10 February 2020
13:30 – 14:20
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 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.
Q1 a) State what is meant by the physical control of pests, giving ONE NAMED example.

b) Describe TWO distinct symptoms of damage caused to plants by rabbits.

c) Describe TWO distinct methods to control rabbits.
Q2 a) Name **ONE** resistant plant cultivar for **ONE NAMED** disease.

b) For the disease named above, describe **TWO** distinct control methods (other than growing resistant cultivars).

1. ................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................

2. ................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................

c) Describe **TWO** ways in which the selection of appropriate plants for soil conditions can help prevent plant health problems.

1. ................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................

2. ................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................................
Q3 a) State ONE benefit of encouraging EACH of the following organisms into a garden by completing the table below:

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b) Describe TWO distinct practices that can be used to restore the balance of natural plant protection in a garden.

1. ........................................................................................................ 2

2. ........................................................................................................ 2

Please see over/.....
Q4  a) Describe **ONE** feature of perennial weeds that can make them successful in a domestic lawn.

b) Name **TWO** distinct weeds typically found growing in **EACH** of the following situations:

i) lawns

ii) woody perennial plantings

c) For **EACH** of the situations below

i) **NAME ONE** herbicide (active ingredient) to control perennial weeds

ii) state the mode of action

by completing the table.

<table>
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Q5 a) Describe, using a labelled diagram, the life cycle of the potato cyst eelworm.

b) Describe the symptoms of potato cyst eelworm.

Please see over/....
State **ONE** effect on plant growth and **ONE** solution to overcome **EACH** of the following causes of plant disorders, by completing the table below:

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**Total Mark**
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<table>
<thead>
<tr>
<th>Candidates Registered</th>
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<tbody>
<tr>
<td>905</td>
<td>615</td>
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<tr>
<td>Candidates Entered</td>
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<td>754</td>
<td>304</td>
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<td>83%</td>
<td>41%</td>
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<td>Candidates Absent/Withdrawn</td>
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<td>122</td>
<td>311</td>
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<tr>
<td>14%</td>
<td>41%</td>
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<tr>
<td>Candidates Deferred</td>
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<td>29</td>
<td>139</td>
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<td>3%</td>
<td>18%</td>
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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 physical control of pests, giving ONE NAMED example.

b) Describe TWO distinct symptoms of damage caused to plants by rabbits.

c) Describe TWO distinct methods to control rabbits.

Q1a) Most candidates correctly stated that the physical control of pests is the removal of the pest or preventing the pest from reaching the plant and were awarded full marks. This can be achieved by:

- Placing fine mesh netting over brassicas to prevent cabbage whitefly from laying eggs
- The use of copper tape/ grit/eggshells/slug pubs to prevent slugs accessing plants
- Hand picking pests e.g. slugs and destroying them by placing in a bucket of water
- Rubbing off aphids and rubbing them between the finger and thumb
- The use of rabbit fencing to prevent them from accessing crops

Q1b) A wide range of symptoms of damage caused by rabbits was described by the best candidates who gained full marks. Suitable answers included:

- Young shoots of herbaceous plants can be grazed to the ground
- Foliage and shoots of woody plants can be grazed up to a height of 50cm by rabbits standing on their hind legs
- Bark can be gnawed away from the base of tree trunks in winter when there is less food available which kills the tree if ringbarked
- Holes and scrapes can be created in lawns and flowerbeds which can kill plants if they are uprooted and lawns can become uneven with bare patches if soil is left on the surface

Q1c) Candidates who were able to provide good descriptions of suitable methods to control rabbits achieved maximum marks. Acceptable answers included:

- The erection of rabbit proof fencing where the bottom 30cm is buried below ground level with the lower 15cm bent outwards to prevent rabbits from tunnelling underneath
- Use of plastic or biodegradable tree guards/spirals or wire netting to protect the trunks of young trees
- Animal repellents suitable for spraying on plants which contain aluminium ammonium sulphate. These have a bitter taste which deter the rabbits from eating the plants
- Shooting rabbits with a licensed gun and ensuring public safety
- Traps can be used either to kill or catch rabbits. These must be checked regularly to ensure humane control
- Ferreting is a traditional method used to drive rabbits out of their burrow into nets placed over the entrance of the tunnel
**Q2 a)** Name **ONE** resistant plant cultivar for **ONE NAMED** disease.

**b)** For the disease named above, describe **TWO** distinct control methods (other than growing resistant cultivars).

1. ………………………………………………………………………………………… 2
2. ………………………………………………………………………………………… 2

**c)** Describe **TWO** ways in which the selection of appropriate plants for soil conditions can help prevent plant health problems.

1. ………………………………………………………………………………………… 2
2. ………………………………………………………………………………………… 2

**Q2a)** The majority of candidates named a suitable cultivar that is resistant to a specific disease and achieved full marks. Suitable answers included:

- Potato ‘Mira’, ‘Cara’, ‘Valor’ for Potato Blight
- *Rosa* ‘Queen Elizabeth’, *Rosa* ‘Charisma’ for Rose Black Spot
- Hollyhock ‘Antwerp Mixed’ for Hollyhock Rust
- Cabbage ‘Kilaxy’, Cabbage ‘Kilaton’ for Club Root
- Carrot ‘Flyaway’ for Carrot Root Fly

**Q2b)** Candidates who clearly understood the named diseases were able to provide suitable control methods and were awarded full marks. Acceptable answers included e.g. for Potato Blight:

- Infected material should be destroyed by burying it more than 45cm deep or by burning it
- Potatoes should be earthed up prior to blight warnings to obtain some protection for tubers
- Select early harvested potatoes which are more likely to avoid infection
- Gardeners can access forecast warnings of when blight is active in their area e.g. Smith’s period or Hutton Criteria when there have been confirmed cases. Applications of fungicides can then be planned
- When infection levels reach approximately 25% of leaves being infected or marks appear on stems, cut off the foliage (haulm) by severing the stems near soil level and remove the debris. When the skin on the tubers has hardened (approximately two weeks later) the tubers can be lifted
- Ensure that no rogue potatoes are left in the soil which could harbour the disease to infect the next crop
The best candidates described ways in which plant selection for specific soil conditions can help prevent plant health problems. Suitable answers included:

- Select plants for the correct soil pH e.g. calcifuge plants *Pieris japonica* must be grown in an acid soil to prevent symptoms of lime-induced chlorosis due to iron being unavailable in a calcareous soil.
- It is preferable to grow cabbage in an alkaline soil to avoid club root which is more prevalent in an acid soil.
- Select plants which are suitable for specific soil conditions e.g. wet/waterlogged i.e. *Iris pseudacorus*.
- Crops e.g. carrots require specific soils e.g. well drained sandy soils without compaction or large stones. This avoids abnormal or stunted/distorted root growth of the carrots.
Q3 a) State **ONE** benefit of encouraging **EACH** of the following organisms into a garden by completing the table below:

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b) Describe **TWO** distinct practices that can be used to restore the balance of natural plant protection in a garden.

1. ........................................................................................................................................ 2
2. ........................................................................................................................................ 2

Q3a) The majority of candidates provided suitable benefits for each of the specific organisms and gained maximum marks. Appropriate answers included:

- **Ladybirds** - control aphids
- **Lacewings** - control aphids
- **Hoverfly** - are pollinators
- **Hedgehog** - eat slugs
- **Birds** - eat aphids and slugs
- **Frogs** - eat slugs
Q3b) Candidates who clearly understood the importance of restoring the balance of natural plant protection described a range of suitable practices. These included:

- The installation of bird boxes and bird feeders can encourage birds e.g. blue tits into the garden which will feed on aphids
- The installation of a pond will encourage frogs and birds which will feed on slugs and aphids
- Use of companion planting will reduce the need to use pesticides
- Use of barriers/fine netting to control cabbage white butterfly from accessing crops to lay eggs
- Establish wildlife areas which are not disturbed e.g. log piles for hedgehogs and frogs to hide
- Avoid collecting all leaves and debris to create a habitat for beneficial animals and insects
Q4 a) Describe **ONE** feature of perennial weeds that can make them successful in a domestic lawn.

b) Name **TWO** distinct weeds typically found growing in **EACH** of the following situations:

   i) lawns
   ii) woody perennial plantings

   MARKS 2

   MARKS 2

c) For **EACH** of the situations below

   i) **NAME ONE** herbicide (active ingredient) to control perennial weeds
   ii) state the mode of action

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   MARKS 2

Q4a) Candidates who understood the botanical characteristics of perennial weeds were able to provide suitable features of how they can be successful in a lawn and gained full marks.

Perennial weeds have storage organs e.g. tap roots and rhizomes, which enable the weeds to survive the winter. They can also re-grow from storage organs or produce stolons/runners, which makes them good at reproduction. Perennial weeds are often low growing, rosette shaped or mat forming and can withstand close mowing.

Q4b) The best candidates named appropriate weed species that grow in specific situations and were awarded full marks. These included:

   i) **Lawns** – *Taraxacum officinale*, *Ranunculus repens*, *Trifolium repens*, *Poa annua*, *Veronica persica*.

   ii) **Woody Perennial Plantings** – *Aegopodium podagraria*, *Rumex obtusifolius*, *Elymus repens*, *Cardamine hirsuta*, *Capsella bursa pastoris*.

Q4c) Maximum marks were gained by candidates who were able to name and state the mode of action of specific herbicides. Suitable answers included:

   **Lawns** – 2,4D, Mecoprop-P, MCPA are selective translocated herbicides.

   **Woody Perennial Plantings** – Glyphosate is a non-selective/total translocated herbicide.
Q5 a) Describe, using a labelled diagram, the life cycle of the potato cyst eelworm.

b) Describe the symptoms of potato cyst eelworm.

Q5a) The best candidates provided good descriptions of the life cycle of the potato cyst eelworm and achieved full marks. Acceptable answers included:

- The cysts can remain in the soil for up to 20 years and contain 200 to 600 eggs
- The eggs, which hatch in spring are stimulated by the presence of a solanaceous crop or associated weeds
- Male and female eelworms are up to 1mm in length
- The eelworms invade susceptible plants e.g. potatoes and feed
- Females swell up and mate (sexual reproduction) during summer
- The females burst through the root wall but leave their head in
- Male eelworms exit the root to fertilise the female after which they die
- Female bodies swell and develop into cysts which can be seen on the surface of roots
- The cysts fall off back into the soil at harvest in the autumn. There is usually one life cycle per year in field crops

Q5b) Candidates who showed a knowledge of the potato cyst eelworm provided good descriptions of the symptoms of the disease and gained full marks. These included:

Plants display patches of poor/stunted growth with signs of chlorosis which develop from the ground upwards. An affected plant will display many pin-head sized spherical cysts on the roots. During their development the eelworms disrupt the uptake of water and nutrients. Heavily infested plants will die prematurely and yield a poor crop of under-sized tubers.

When an area is first infected by potato cyst eelworm only a small part of it may be affected. In successive years the infected area will grow until it is impossible to grow acceptable potatoes.
Q6) State **ONE** effect on plant growth and **ONE** solution to overcome **EACH** of the following causes of plant disorders, by completing the table below:

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Many candidates were able to state the effect on plant growth of specific plant disorders and provided suitable solutions. These included:

**Low pH** – Yellow leaf spots leading to browning and leaf death. Stunted growth and calcium deficiency on calcicole plants growing in acid soil. Phosphorus, magnesium and potassium deficiency. Increased risk of clubroot in brassicas. These can be overcome by the incorporation of lime into the soil e.g. ground limestone, calcium carbonate, calcified seaweed, ground chalk etc.

**High pH** – Iron deficiency symptoms i.e. interveinal chlorosis on calcifuge plants due to lime-induced chlorosis. Manganese, copper, zinc and boron deficiency. These can be overcome by the incorporation of sulphur, sulphur chips, aluminium sulphate, ferrous sulphate or pine needles. A foliar feed of iron sequestrine can also be used.

**Shade** – Plants become etiolated, often with thin shoots and long internodes. The stems bend towards the light, foliage is smaller than normal and flowers and fruit are poor. This can be overcome by planting shade tolerant plants e.g. *Hedera helix*, moving existing plants into a sunnier position and reducing overhanging branches and foliage. Seedlings can be thinned out to maximise available light.

**Drought** – Water loss from the plant affects the roots from absorbing water which can interfere with plant growth, a reduction in photosynthesis and poor growth. Leaves wilt, followed by the loss of leaves and buds, die back of shoots or the whole plant. This can be overcome by careful selection of plants, watering in all new plants thoroughly before mulching them with a 7.5cm depth of mulch e.g. gravel or leaf mould. The installation of an automated irrigation system e.g. lay flat seep hose would also be suitable.

**High Temperature** – Plants suffer from a loss of water and excessive sun causes scorch areas on leaves. Woodland plants e.g. *Acer palmatum* are particularly vulnerable to sun damage and Camellia species develop brown patches on their leaves. This can be overcome by careful selection of plants and positioning vulnerable plants out of direct sunlight. Tender seedlings can be protected by shading in greenhouses.

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