



R2103

MAINTAINING PLANT HEALTH

Level 2

Monday 5 February 2018

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 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

MARKS

Q1 a) State **TWO** benefits **AND TWO** limitations of using biological control to minimise the population of pests.

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b) State the control methods for **TWO NAMED** pests by completing the table below.

Named pest	Biological control	Cultural control
1.		
2.		

3

3

Total Mark

Please see over/.....

MARKS

Q2 a) Identify **FOUR** symptoms of Hollyhock rust.

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b) Describe **TWO** cultural methods of controlling Hollyhock rust.

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c) Name **TWO** fungal diseases of plants (other than Hollyhock rust).

2

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Total Mark

Please turn over/.....

MARKS

Q3 a) Describe how the growth habit of **TWO NAMED** perennial weeds causes them to be a problem in an herbaceous border.

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b) State **TWO** methods in which weeds could be controlled in an herbaceous border without the use of herbicides.

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c) State what is meant by the term 'translocated herbicide', naming **ONE** active ingredient.

2

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Total Mark

Please see over/.....

MARKS
6

Q4 a) Describe, with the use of a diagram, the life cycle of the large cabbage white butterfly.

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b) Describe **ONE** suitable method of control for the large cabbage white butterfly under **EACH** of the following headings:

- i) chemical;
- ii) physical.

i).....
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ii).....
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2
2

Total Mark

Please turn over/.....

MARKS

Q5 a) Describe the symptoms of **EACH** of the following plant disorders:

- i) rose balling;
- ii) fasciation;
- iii) excessive shade.

2
2
2

i).....
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ii).....
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iii).....
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b) State **ONE** suitable method of making:

- i) acid soil more alkaline;
- ii) alkaline soil more acid.

1
1

i).....
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ii).....
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c) Explain how plants are affected by growing in an inappropriate soil pH.

2

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Total Mark

Please see over/.....

Q6 a) Describe **ONE NAMED** plant suitable for the following situations by completing the table below.

	Plant name	Plant description
Drought		
Extreme cold		

3

3

b) Describe **ONE** method of avoiding damage to plants from **EACH** of the following:

- i) drought;
- ii) extreme cold.

2
2

i).....

ii).....

Total Mark

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**The Royal Horticultural Society, Wisley, Woking, Surrey GU23 6QB.
Charity Registration Number: 222879/SC038262**

R2103

MAINTAINING PLANT HEALTH

Level 2

Monday 5 February 2018

Candidates Registered	778		Total Candidates Passed	521	81.92%
Candidates Entered	636	81.75%	Passed with Commendation	214	33.65%
Candidates Absent/Withdrawn	131	16.84%	Passed	307	48.27%
Candidates Deferred	11	1.41%	Failed	115	18.08%

Senior Examiner's Comments:

- 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.
- 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.
- 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 **TWO** benefits **AND TWO** limitations of using biological control to minimise the population of pests.

4

b) State the control methods for **TWO NAMED** pests by completing the table below.

Named pest	Biological control	Cultural control
1.		
2.		

3

3

Q1a) The majority of candidates showed a good understanding of the benefits and limitations of using biological control to minimise pest populations, and gained full marks. Suitable answers included;

Benefits

- Reduces the use of chemicals
- Reduces operator exposure to harmful chemicals
- Reduces the incidence of pest resistance
- Does not harm beneficial insects
- Maintains pest/predator balance
- Targets specific pests

Limitations

- Requires a knowledge of the pest life cycle
- May require a controlled environment
- Must accept some pest damage
- Must apply when conditions are right
- Each pest requires a different control agent
- Effects may not be immediate

Q1b) Candidates who named a range of suitable pests, e.g. slug, black bean aphid, large cabbage white butterfly, glasshouse whitefly, two spotted spider mite and vine weevil, and correctly stated a suitable biological and cultural control for each were awarded full marks. Acceptable answers included;

Slugs can be controlled biologically by using the nematode *Phasmarhabditis hermaphrodita* or culturally by removing any rotting debris where slugs can hide or by surface cultivation to expose slug eggs to predators.

Glasshouse Whitefly can be controlled biologically by using the parasitic wasp *Encarsia Formosa* or the predatory mite *Amblyseius swirskii*. Culturally new plants can be placed in quarantine and good hygiene should be practiced by frequently cleaning the greenhouse and glass and removing host weeds that harbour the pest.

Black Bean Aphid can be controlled biologically by using the parasitic wasp *Aphidius colemani* or the predatory midge *Aphidoletes aphidmyza*. Cultural control can be carried out by pinching out the tender growing tips of plants before the aphids appear or sowing an autumn crop of beans which are less susceptible to attack as the growing tips will have matured.

	MARKS
Q2 a) Identify FOUR symptoms of Hollyhock rust.	4
b) Describe TWO cultural methods of controlling Hollyhock rust.	4
c) Name TWO fungal diseases of plants (other than Hollyhock rust).	2

Q2a) A range of symptoms of Hollyhock rust were identified by most candidates who gained maximum marks. Suitable answers included;

- Bright orange spots on upper side of leaf
- Brown spots on underside of leaf
- Spore producing pustules
- Pustules turn ash grey in high humidity
- Lower leaves affected first
- Leaves shrivel and fall off

Q2b) Candidates who clearly understood that the spores of Hollyhock rust can overwinter if the debris is not destroyed or removed from the site provided good descriptions of cultural methods of controlling Hollyhock rust. Acceptable answers included;

- Pick off infected leaves and destroy by burning
- Remove badly infected plants totally and destroy by burning
- Cut down infected plants in the autumn and destroy all arisings by burning
- Grow as a biennial then remove the plant and destroy it by burning after flowering
- Do not use seed from infected plants
- Avoid growing other plants from the Malvaceae family

Q2c) The majority of candidates were able to name fungal diseases and were awarded full marks. Suitable answers included; honey fungus, powdery mildew, botrytis, damping off, club root and apple and pear canker.

Candidates who named bacterial or viral diseases could not be awarded any marks.

	MARKS
Q3 a) Describe how the growth habit of TWO NAMED perennial weeds causes them to be a problem in an herbaceous border.	6
b) State TWO methods in which weeds could be controlled in an herbaceous border without the use of herbicides.	2
c) State what is meant by the term 'translocated herbicide', naming ONE active ingredient.	2

Q3a) Most candidates were able to name perennial weeds whose growth habit causes them to be a problem in an herbaceous border but only the best candidates provided good descriptions of how the weeds achieved this. Answers that gained full marks included;

Aegopodium podagraria has an invasive rhizomatous root system which penetrates and overcrowds herbaceous plants competing for water, light and nutrients. It is difficult to remove from established plants as just a small fragment of root will regrow.

Taraxacum officinale has a deep tap root that enables it to regrow if it is not entirely removed. It can be spread rapidly by seed and is unsightly in an herbaceous border.

Other perennial weeds that were described included; *Ranunculus repens*, *Calystegia sepium* and *Elymus repens*.

Q3b) Full marks were gained by candidates who were able to state suitable methods of control for weeds in an herbaceous border. These included;

- Use of a sharp hoe to hoe frequently on a sunny day to allow the roots of the weeds to dry out
- Hand pull weeds before they set seed
- Keep adjacent areas weed free, e.g. lawns
- Dense planting to reduce light available for seeds to germinate

Q3c) The majority of candidates were able to state that a translocated herbicide is absorbed through the leaves and moves through the plant system to affect all parts of the plant, eventually killing the whole plant.

Glyphosate was the most widely named active ingredient of a translocated herbicide by candidates although 2,4-D, MCPA and Mecoprop were also awarded marks.

Q4 a) Describe, with the use of a diagram, the life cycle of the large cabbage white butterfly.

6

b) Describe **ONE** suitable method of control for the large cabbage white butterfly under **EACH** of the following headings:

i) *chemical*;

2

ii) *physical*.

2

Q4a) Most candidates were able to draw a clearly labelled diagram of the large cabbage white butterfly. Full marks were awarded to candidates who described the four main stages of the life cycle, i.e. egg, larvae, pupa and adult. Suitable answers included;

Eggs are yellow and skittle shaped. Up to fifty are laid on the underside of brassica leaves during April/May and July/August and hatch in one to two weeks.

Larvae are yellow and black striped caterpillars which go through four moults (instars) while feeding on brassica leaves for a month.

Pupa overwinters on fences, walls and buildings.

Adult emerges in spring (April/May).

Q4b) Candidates who described the methods of control for the large cabbage white butterfly gained maximum marks. Acceptable answers included:

i) **Chemical**, e.g. deltamethrin applied as a spray at the larvae stage in the pest's life cycle.
Other suitable chemicals included; Fatty acids, Pyrethrum, Chlorpyrifos, Thiacloprid, Cypermethrin, Lambda-cyhalothrin.

It is very important that when naming chemicals in an examination that they are still approved for use.

ii) **Physical**, by covering the crop with fine netting, 'Enviromesh' or horticultural fleece before the adult lays eggs. The netting must not touch the crop. It is important to inspect the plants frequently and pick off and squash the eggs or caterpillars to prevent the crop from being damaged.

Q5 a) Describe the symptoms of **EACH** of the following plant disorders:

- | | |
|-----------------------|----------|
| i) rose balling; | 2 |
| ii) fasciation; | 2 |
| iii) excessive shade. | 2 |

b) State **ONE** suitable method of making:

- | | |
|------------------------------|----------|
| i) acid soil more alkaline; | 1 |
| ii) alkaline soil more acid. | 1 |

c) Explain how plants are affected by growing in an inappropriate soil pH. **2**

Q5a) Maximum marks were gained by candidates who were able to provide detailed descriptions of specific plant disorders. Details that were awarded marks included;

- i) **Rose Balling** where the outer petals are fused together and the flowers fail to open. The buds are soft and slimy, the outer petals turn brown and become dry and crisp. The buds may drop off or remain on the plant and rot as a result of grey mould.
- ii) **Fasciation** is where the stems of a plant are flattened and appear to be composed of several shoots that have fused together. Flattened, elongated flower heads also occur with the distorted flowers producing numerous flower heads.
- iii) **Excessive Shade** causes the shoots of plants to become weaker and etiolated where they grow towards the light and have long internodes. The leaves become pale/yellow with reduced flowering and in the long term the plant could die.

Q5b) The majority of candidates were able to provide a suitable method of making;

- i) **Acid soil more alkaline**, e.g. addition of ground limestone, calcium carbonate (lime), calcified seaweed, ground chalk, dolomitic limestone (ground magnesium limestone) or hydrated lime (calcium hydroxide).
- ii) **Alkaline soil more acid**, e.g. addition of sulphur (sulphur chips), aluminium sulphate, ferrous sulphate (sulphate of iron) or the addition of pine needles.

Q5c) Many candidates explained that the plants' ability to take up nutrients is affected by growing them in an inappropriate soil pH. This may lead to stunted growth/lack of vigour or even lime induced chlorosis which causes yellowing of the leaves in ericaceous plants, e.g. *Camellia japonica*.

Q6 a) Describe **ONE NAMED** plant suitable for the following situations by completing the table below.

	<i>Plant name</i>	<i>Plant description</i>
Drought		
Extreme cold		

3

3

b) Describe **ONE** method of avoiding damage to plants from **EACH** of the following:

- i) drought;
- ii) extreme cold.

2

2

Q6a) Candidates who were awarded full marks were able to name and describe a suitable plant for each of the situations. These included;

Drought, e.g. *Lavandula angustifolia* which has narrow grey-green leaves and fragrant pale to deep purple flowers in mid and late summer or *Rosmarinus officinalis* which has aromatic, narrow, leathery dark green leaves which are white felted beneath and tubular two lipped purple blue flowers in mid spring to early summer and again in autumn.

Extreme Cold, e.g. *Pinus sylvestris* which has pairs of blue-green twisted needles, conical red-brown female cones and purple-grey bark or *Taxus baccata* which has linear, glossy dark green leaves, pale beneath in two ranks and fruits of a single seed with red arils. The bark is purple-brown in colour.

Marks were only awarded to plants that were listed as H6 or H7 in the RHS Hardiness ratings for extreme cold.

Q6b) The best candidates provided accurate descriptions of a range of methods that can be used to avoid damage to plants from specific situations. Suitable answers included;

Drought

- Frequent hand watering or by the use of leaky pipe or specific irrigation systems
- Cultivate the soil deeply and incorporate large quantities of organic matter to improve the soil structure
- Selection of plants with grey-green or silver foliage as they reflect the suns' rays to conserve moisture
- Use of mulch, e.g. composted bark to a depth of 5-7.5cm to help retain moisture

Extreme Cold

- Selection of appropriate plants and avoiding planting them in frost pockets
- Leaving the previous seasons growth on more tender plants until the spring to provide some protection
- Plant out half hardy bedding plants after the danger of frost has passed. Always harden them off before planting out
- Tender plants should be planted in warm sunny areas e.g. against a south facing wall
- Tender plants can be covered with horticultural fleece or susceptible crowns of plants can be packed with bracken or straw
