Government of **Western Australia**
School Curriculum and Standards Authority

WACE
Western Australian Certificate of Education

Western Australian Certificate of Education Examination, 2013

Question/Answer Booklet

PLANT PRODUCTION SYSTEMS

Stage 3

Please place your student identification label in this box

Student Number: In figures | | | | | | | | | |

In words _____

_____

Time allowed for this paper

Reading time before commencing work: ten minutes
Working time for paper: three hours

Materials required/recommended for this paper

To be provided by the supervisor
This Question/Answer Booklet
Multiple-choice Answer Sheet

Number of additional answer booklets used (if applicable): ☐

To be provided by the candidate
Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: non-programmable calculators approved for use in the WACE examinations

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Ref: 13-126

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of exam
Section One: Multiple-choice	15	15	20	15	15
Section Two: Short answer	7	7	90	88	50
Section Three: Production practices	1	1	30	29	15
Section Four: Extended answer	3	2	40	40	20
				Total	100

Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2013*. Sitting this examination implies that you agree to abide by these rules.

2. Answer the questions according to the following instructions.

   Section One: Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

   Sections Two, Three and Four: Write your answers in this Question/Answer Booklet.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.

4. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
   - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
   - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

See next page

Section One: Multiple-choice **15% (15 Marks)**

This section has **15** questions. Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 20 minutes.

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1. When the population of a pest and its predator are in equilibrium, this is known as

   (a) an economic threshold.
   (b) an economic injury level.
   (c) a positive feedback loop.
   (d) a negative feedback loop.

2. Seed banks are useful to plant breeders as a source of

   (a) genetically modified traits.
   (b) new genetic material.
   (c) new crop varieties.
   (d) phenotypes.

3. Carbohydrates produced during photosynthesis are utilised by plants for

   (a) nutrient uptake.
   (b) nodulation.
   (c) respiration.
   (d) transpiration.

4. Which of the following is a by-product of photosynthesis?

   (a) oxygen
   (b) sugar
   (c) water
   (d) carbon dioxide

5. Nutrients are transported from roots to shoots via

   (a) xylem.
   (b) phloem.
   (c) root hairs.
   (d) stomata.

See next page

Questions 6 and 7 refer to the table below:

Mode of action	Examples
Group A	Hoegrass, Tristar
Group B	Logran, Broadstrike
Group C	Atrazine, Diuron
Group D	Treflan, Prothal

6. A herbicide's 'mode of action' is related to the

   (a) group name.
   (b) active ingredient.
   (c) crop applied to.
   (d) method of application.

7. Which combination of herbicides will help prevent weeds becoming herbicide resistant?

   (a) Hoegrass and Tristar
   (b) Broadstrike and Logran
   (c) Treflan and Prothal
   (d) Tristar and Treflan

8. What is the main role of cytokinins in plants?

   (a) fruit ripening
   (b) seed dormancy
   (c) cell elongation
   (d) cell division

9. Which of the following would help maintain intergenerational equity?

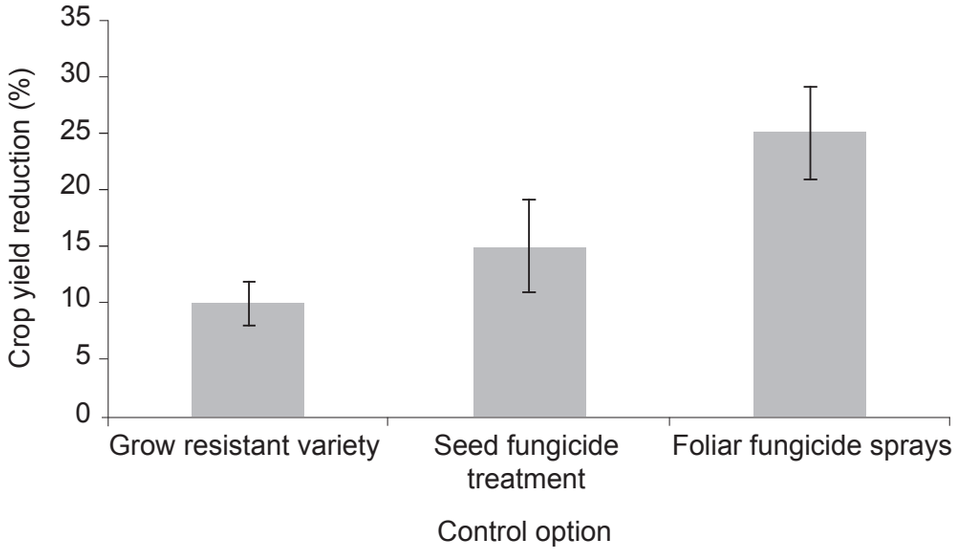
   (a) dividing farm assets among children
   (b) using sustainable farming practices to preserve natural resources
   (c) clearing more land for future generations to farm
   (d) reducing debt by selling off land

See next page

Questions 10 relates to the data in the graph below.

To minimise the impact of stripe rust on a crop, a producer compares the effectiveness of three different control options (values are the mean ± standard deviation):

Comparison of control options for stripe rust



10. The best option for minimising the impact of stripe rust on crop yield is to

(a) grow a more resistant variety.
(b) apply seed fungicide treatment.
(c) apply foliar fungicide spray.
(d) do nothing.

11. What does risk mitigation involve?

(a) identifying potential risks
(b) finding solutions to reduce risk
(c) identifying consequences of risk
(d) assessing risk probability

12. Synthetic auxin can be used as a

(a) herbicide.
(b) fertiliser.
(c) seed treatment.
(d) dormancy breaker.

13. Scientific investigations are designed to

(a) complete field trials.
(b) create tables and figures of results.
(c) test a hypothesis.
(d) test theories.

See next page

14. Which hormone is used to help hard seeds germinate?

(a) abscisic acid (ABA)
(b) auxins
(c) cytokinins
(d) gibberellins

15. Keeping records of pesticides that have been sprayed on crops is an example of

(a) integrated pest management.
(b) prevention of pesticide resistance.
(c) quality assurance.
(d) intergenerational equity.

End of Section One

See next page

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See next page

Section Two: Short answer **50% (88 Marks)**

This section has **seven (7)** questions. Answer **all** questions. Write your answers in the spaces provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

Suggested working time: 90 minutes.

Question 16 **(11 marks)**

A producer has purchased extra land and needs to decide what crop to sow. The table below summarises the current budget for the producer's two main enterprises; potatoes and garlic.

Income	**Potatoes**	**Garlic**
Average yield (t/ha)	25	7
Average price ($/t)	600	3000
Total income		
Variable costs	**$/ha**	**$/ha**
Seed	1800	3700
Machinery costs	150	800
Irrigation	600	150
Fertiliser	2500	550
Pest control	85	700
Casual labour	250	450
Harvesting/processing	1200	5500
Marketing	5600	3220
Total variable costs		
Gross margin		

See next page

(a) Which enterprise is more profitable? Explain your answer and show your calculations. (8 marks)

(b) The producer decides to purchase a new machine for harvesting potatoes that will reduce the casual labour employed for harvest. Explain how this will affect the profitability of potatoes. (3 marks)

See next page

Question 17 **(11 marks)**

(a) Define the process of transpiration in plants and draw a labelled sketch of a plant, illustrating the process of transpiration. (4 marks)

(b) Identify **two** factors that can affect transpiration and comment on how they can increase plant water use. (4 marks)

See next page

(c) Explain, using an example, why producers need to be aware of soil water availability when making management decisions. (3 marks)

See next page

Question 18 **(11 marks)**

A producer notices that the older leaves in a crop are yellowing. The crop is in its early vegetative growth phase and there are no pests or diseases in the paddock.

(a) Predict what might be causing the leaves to turn yellow. (2 marks)

(b) Propose a strategy to test your prediction about what is causing the leaves to turn yellow. (3 marks)

(c) Recommend an approach the producer could take to deal with the yellowing leaves. (2 marks)

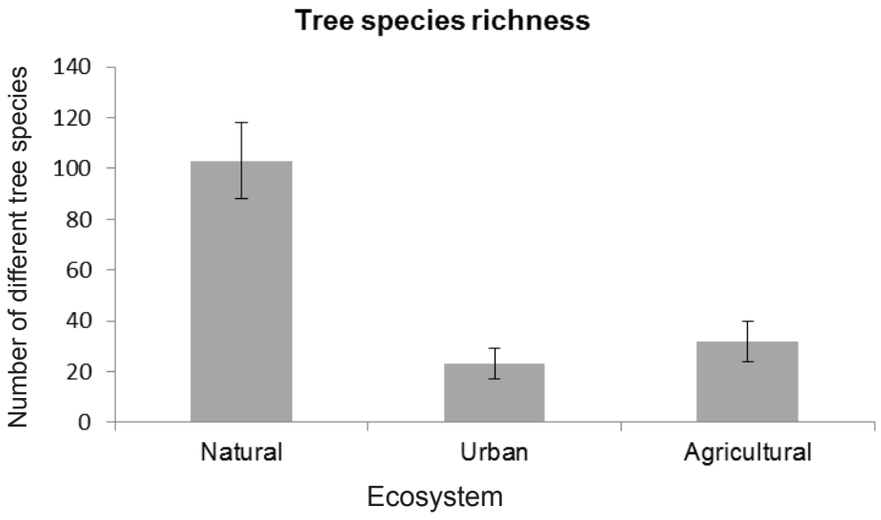
See next page

(d) Outline **two** factors that would affect the producer's decision to apply fertiliser to the crop. (4 marks)

See next page

Question 19 **(11 marks)**

The graph below shows the means and standard deviations of a preliminary trial looking at species richness in natural, urban and agricultural systems. Five different sites were sampled within each ecosystem by counting the number of different tree species within a 10 metre quadrant area.



(a) Is there a significant difference between urban and agricultural ecosystems in the number of tree species? Explain your answer. (2 marks)

(b) Are there any limitations to the data obtained from the trial? Justify your response. (3 marks)

See next page

(c) Construct a hypothesis for an experiment to compare the diversity of soil microbes in natural and agricultural ecosystems. (3 marks)

(d) Describe how energy from sunlight can flow between natural, urban and agricultural ecosystems. (3 marks)

See next page

Question 20 **(11 marks)**

Australia has a comparative advantage in relation to many of its agricultural products in the global market place.

(a) Using an example, explain the term 'comparative advantage'. (3 marks)

(b) Outline **two** benefits that Australia's quarantine laws provide to plant producers. (4 marks)

(c) Suppose there is an outbreak of a new plant pest or disease in Western Australia. Describe **two** possible impacts of this outbreak on the global competitiveness of the Australian industry. (4 marks)

See next page

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See next page

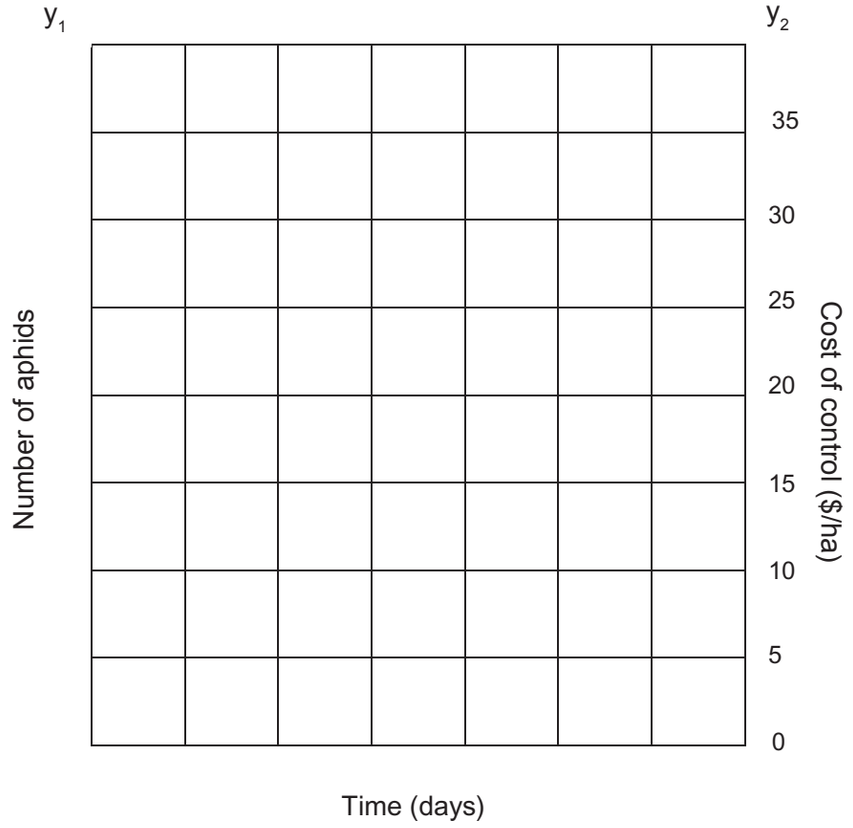
Question 21 **(17 marks)**

It has been predicted by authorities that there is a high probability of an aphid outbreak occurring this year, so you decide to start monitoring the number of aphids in your crop. Below is a summary of your observations over a one month period.

Days	Average number of aphids per plant
0	2
5	2
10	10
13	20
16	30
19	35
22	36
25	35
30	35

(a) Graph the number of aphids observed over time on the grid below, using the y-axis on the left (y_1). On the right axis (y_2) is a scale for the cost of spraying the aphids. Draw a line to indicate that the current cost of control is \$17/ha. (5 marks)

(If you need to make a second attempt at this graph item, the grid is repeated on the last page of this Question/Answer booklet. Indicate on this page that you have used the second grid and cancel the workings on this page.)



See next page

(b) (i) Define the term ‘economic injury level’. (2 marks)

(ii) Identify on the graph when the economic injury level would occur for the aphids. (2 marks)

(iii) Indicate on the graph what would happen to the economic injury level if the cost of spraying for aphids increased by $5/ha. (2 marks)

(c) Outline a strategy for controlling the aphid outbreak at local, national and international levels. (6 marks)

See next page

Question 22 **(16 marks)**

Plant producers manage nutrition programs across multiple enterprises during the growing season.

(a) For **two** selected plant production systems, provide a nutritional requirement and a fertiliser option by completing the table below. (12 marks)

Timing	Enterprise 1: _____	Enterprise 2: _____
Start of season (or germination)	Nutritional requirement: Fertiliser option:	Nutritional requirement: Fertiliser option:
Mid-season (or vegetative growth phase)	Nutritional requirement: Fertiliser option:	Nutritional requirement: Fertiliser option:
Towards end of growing season (or reproductive growth stage)	Nutritional requirement: Fertiliser option:	Nutritional requirement: Fertiliser option:

See next page

(b) Describe **two** approaches to reducing the risk of nutrient pollution when applying fertiliser. (4 marks)

End of Section Two

Section Three: Production practices **15% (29 Marks)**

This section contains **one (1)** question. You **must** answer this question. Write your answer in the space provided.

Use a plant production enterprise in which you participated during your course this year to answer Question 23.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

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- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

Suggested working time: 30 minutes.

Question 23 **(29 marks)**

(a) (i) Sketch a diagram of the annual production cycle for a plant enterprise that you studied in 2013. (4 marks)

Name of enterprise: _____ (no marks)

See next page

(ii) Predict a possible problem relating to the harvest stage of the production cycle for your enterprise. Outline, using an example, how you would manage or adapt to this problem. (4 marks)

(b) (i) Describe **two** possible threats to your enterprise due to the effects of climate change. (4 marks)

See next page

Question 23 (continued)

(ii) Justify, using **two** examples, how you could adapt your enterprise to ensure production is not reduced due to the effects of climate change. (4 marks)

(c) (i) Provide an example of a change in consumer trends that could reduce demand for a product from your enterprise. (2 marks)

(ii) Demonstrate **two** ways in which you could modify your production system in response to a change in consumer trends. (4 marks)

See next page

(d) (i) Outline a new technology relevant to your enterprise and evaluate the potential for this new technology to improve production. (4 marks)

(ii) Outline a possible duty of care issue that would need to be considered if you were to implement the new technology. Explain what changes you would make to ensure that the duty of care issue was addressed. (3 marks)

End of Section Three

See next page

Section Four: Extended answer **20% (40 Marks)**

This section contains **three (3)** questions. You must answer **two (2)** questions. Write your answers in the spaces provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

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Suggested working time: 40 minutes.

Question 24 **(20 marks)**

(a) Define the term 'Genetically Modified Organism' (GMO) in the context of plant breeding. Provide an example of a plant that has been genetically modified and explain how the genetic modification could enhance production. (6 marks)

See next page

(b) Describe **one** advantage and **one** disadvantage of using genetic modification to produce new cultivars. Explain an ethical concern (perceived or real) related to the use of GMOs in plant production. Discuss the reasons for **and** against this concern. (10 marks)

See next page

Questions 24 (continued)

(c) Provide an example of how genetic modification could help to produce a new cultivar for a specific environment **and** for a specific market need. (4 marks)

See next page

Question 25 **(20 marks)**

Conserving remnant bushland often comes at the cost of increasing plant production on farms.

(a) Describe **two** reasons why native remnant bushland should be conserved and how it can benefit plant production. (6 marks)

(b) Define the term 'Triple Bottom Line' in the context of sustainable plant production. For each component of the 'triple bottom line', explain how it could affect your decision to conserve native bushland on a farm. (11 marks)

See next page

Question 25 (continued)

(c) Using remnant bushland as an example, justify how you would balance short-term profitability with the long-term sustainability of your enterprise. (3 marks)

See next page

Question 26 **(20 marks)**

Herbicide resistance in weeds is becoming a major problem, both in Australia and elsewhere.

(a) For a plant enterprise of your choice, name a common weed and describe how it could become resistant to a herbicide. Predict the impact on production if herbicide resistance did develop in this weed, and justify your response. (5 marks)

(b) Integrated Pest Management uses a range of control options to kill weeds. Discuss at least **three** control options that could be used over two seasons to prevent herbicide resistance developing in the weed. (9 marks)

See next page

Question 26 (continued)

(c) Assess the likelihood of your weed becoming resistant and the consequences of herbicide resistance occurring. Propose a range of strategies to deal with this risk, including risk avoidance and mitigation strategies. (6 marks)

End of questions

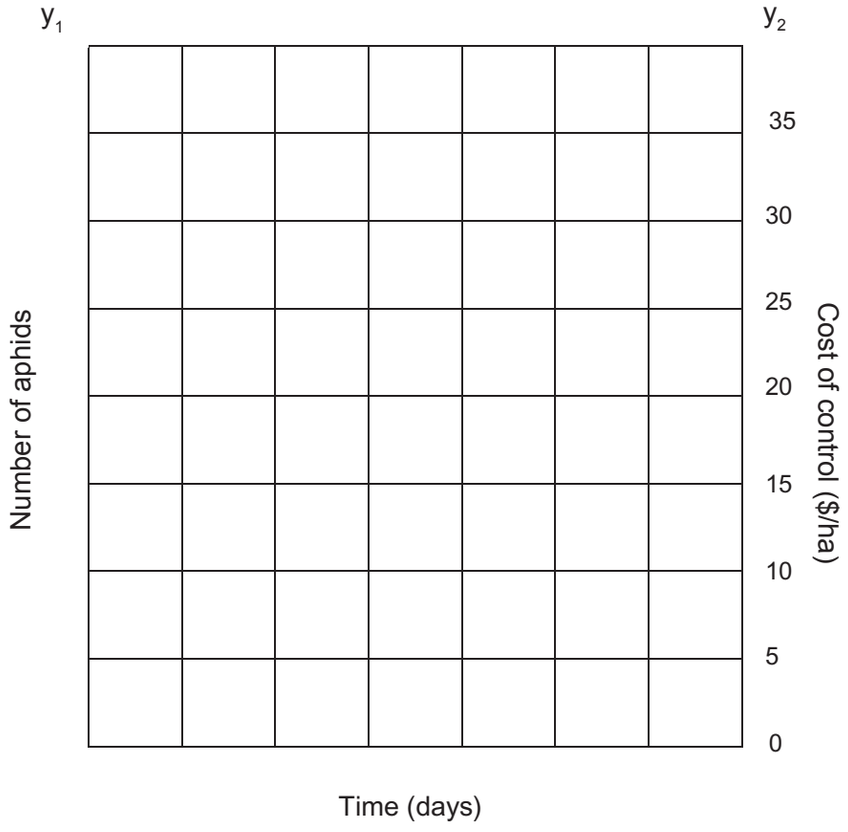
Spare answer page

Question number: _____

Spare answer page

Question number: _____

Question 21


y1
y2
35
30
25
20
15
10
5
0
Number of aphids
Cost of control ($/ha)
Time (days)

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