



Western Australian Certificate of Education Examination, 2015

Question/Answer Booklet

PLANT PRODUCTION SYSTEMS

Stage 3

Please place your student identification label in this box

Student Number: In figures

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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.

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	92	50
Section Three: Production practices	1	1	30	32	15
Section Four: Extended answer	3	2	40	40	20
Total					100

Instructions to candidates

- The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2015*. Sitting this examination implies that you agree to abide by these rules.

- 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.

- 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.
- 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.

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.

1. Glucose is a product from which plant process?
 - (a) transpiration
 - (b) photosynthesis
 - (c) respiration
 - (d) nodulation

2. Applying too much fertiliser can lead to
 - (a) nutrient deficiency in plants.
 - (b) pesticide resistance.
 - (c) increased carbon dioxide in the atmosphere.
 - (d) contamination of waterways.

3. Which one of the following is a source of genetic diversity for plant breeding?
 - (a) old varieties stored in seed banks
 - (b) clones from cuttings
 - (c) weed seed banks in the soil
 - (d) tissue cultures

4. Australia can produce wheat at a lower opportunity cost than Japan. This means that
 - (a) Australia can produce wheat more easily than Japan.
 - (b) Japan can produce wheat more easily than Australia.
 - (c) Japan has a comparative advantage over Australia.
 - (d) Australia has a comparative advantage over Japan.

5. What does the 'triple bottom line' refer to in plant production?
 - (a) intergenerational equity
 - (b) stewardship
 - (c) social, economic and environmental factors
 - (d) social, economic and genetic factors

Questions 6, 7 and 8 are based on the following table, which shows a comparison between human and robotic grape picking.

Comparison between human and robotic grape picking

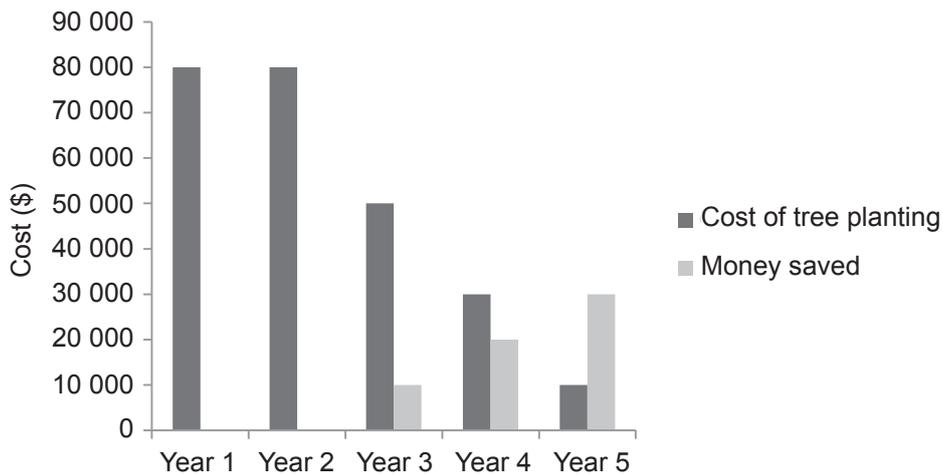
Evaluation criteria	Current process: human labour	New technology: robotic machine
Upfront cost	\$0	\$500 000
Ongoing costs	\$90 000 per year for salaries	\$2000 per year for servicing and repairs
Effect on yield	None	10% increase
% of distorted grapes (average per vine \pm standard deviation)	$5 \pm 0.5\%$	$6 \pm 0.8\%$

6. Which of the following is the **best** reason for adopting robotic technology for grape picking?
- (a) Over a 5 year period it will be cheaper to use than human labour.
 - (b) Over an extended time period the robot will save money.
 - (c) Grape quality will be improved by using the robot.
 - (d) Grape size will be improved by using the robot.
7. Other than cost, which of the following factors should be considered before adopting a robotic machine?
- I safety of the machine
 - II training of staff to service the machine
 - III ability to enhance production
- (a) I only
 - (b) I and II only
 - (c) II and III only
 - (d) I, II and III
8. The percentage of distorted grapes is
- (a) significantly higher for the robot because the mean is higher.
 - (b) similar for human labour and the robot based on the standard deviation.
 - (c) the same for human labour and the robot because the means are similar.
 - (d) significantly higher for the robot because the standard deviation is higher.

9. Which of the following helps to maintain Australia’s competitiveness in global food markets?
- (a) government subsidies in competitor countries
 - (b) quota restrictions in Australia
 - (c) new technologies in competitor countries
 - (d) strict quarantine laws in Australia
10. The relationship between food production and population growth is an example of a
- (a) positive feedback loop.
 - (b) negative feedback loop.
 - (c) flow between ecosystems.
 - (d) decline in sustainability.

Questions 11 and 12 refer to the graph below, which compares money spent on tree planting and money saved from the benefits the trees provide to the cropping enterprise.

Cost of tree planting and money saved over five years



11. The decision to plant more trees should be based on
- (a) the immediate financial cost.
 - (b) whether the next generation plans to crop the land.
 - (c) long-term goals to improve sustainability.
 - (d) government legislation on land use.
12. What could indicate the long-term benefits of planting trees?
- (a) Decreased cost over time of planting new and replacing dead trees.
 - (b) Increased crop yields as trees compete with the annual crops for moisture.
 - (c) Natural pest protection and improved soil microbes.
 - (d) Improved biodiversity, as different types of crops can now be grown.

13. The structure of a scientific report should be
- (a) Hypothesis, Title, Introduction, Results, Methods, Discussion.
 - (b) Title, Hypothesis, Introduction, Results, Methods, Discussion.
 - (c) Title, Introduction, Hypothesis, Methods, Results, Discussion.
 - (d) Title, Introduction, Methods, Hypothesis, Results, Discussion.
14. Using an approved contractor to audit a seed supply chain is an example of
- (a) duty of care.
 - (b) quality assurance.
 - (c) risk management.
 - (d) comparative advantage.
15. Crop rotations are an important part of
- (a) integrated pest management.
 - (b) monitoring biosecurity threats.
 - (c) sourcing genetic diversity.
 - (d) fertiliser management.

End of Section One

See next page

Section Two: Short answer

50% (92 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.

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Suggested working time: 90 minutes.

Question 16

(28 marks)

Pest management programs require an understanding of both control options and the timing of controls.

(a) Define the following terms:

(i) Economic threshold (2 marks)

(ii) Economic injury level (2 marks)

(b) (i) Using an example of a pest you have studied, describe how you would make an economic decision about when to spray to control the pest. (3 marks)

Question 16(b) (continued)

- (ii) Outline **two** practical factors you would also need to consider before deciding to spray. (4 marks)

One: _____

Two: _____

- (c) Complete the following summary of an Integrated Pest Management (IPM) strategy for **two** plant enterprises that you have studied. Provide examples of pests and describe **three** different control options for each pest. (14 marks)

Enterprise one: _____	Enterprise two: _____
Pest: _____	Pest: _____
Control option one:	Control option one:
Control option two:	Control option two:
Control option three:	Control option three:

(d) Explain a long-term benefit of using an IPM strategy for pest control. (3 marks)

Question 17

(12 marks)

A market gardener is conducting trials to determine the best soil type for growing vegetables. The following data were collected.

Water-holding capacity of the soil

	Soil type 1 (mm of water per metre of soil depth)	Soil type 2 (mm of water per metre of soil depth)	Soil type 3 (mm of water per metre of soil depth)
Field capacity of the soil	130	300	400
Permanent wilting point	80	100	250
Available water			

(a) Calculate the amount of water available for each soil and enter these values in the table above. (1 mark)

(b) Explain why the three soil types differ in water availability. (3 marks)

Question 17 (continued)

- (c) Construct an hypothesis to predict the nutrient uptake by plants growing in the three soil types. Justify your hypothesis. (4 marks)

- (d) Outline **two** recommendations to ensure that experiments on the three soil types will minimise the sources of error. (4 marks)

One: _____

Two: _____

Question 18

(10 marks)

Plant hormones play a vital role in all aspects of plant function and development and can be managed for different applications in plant production.

- (a) Name **three** plant hormones. For each hormone, identify **one** of its functions related to plant physiology. (6 marks)

Hormone	Function
One: _____	
Two: _____	
Three: _____	

- (b) Select **two** plant hormones and describe how each hormone can be used by a producer to manipulate plant production. (4 marks)

One: _____

Two: _____

Question 19

(15 marks)

New breeding technologies could provide new opportunities for plant production in the future.

- (a) Define the term 'Genetically Modified Organism' (GMO). (2 marks)

- (b) Give an example of a plant that has been genetically modified and explain how it provides an advantage to producers or consumers. (3 marks)

- (c) Discuss **two** ethical issues associated with GMO technology, including an argument for and against each issue. (6 marks)

One: _____

Two: _____

- (d) Describe another source of genetic diversity other than genetic modification and using an example explain how it will enhance plant production. (4 marks)

(b) Explain why transpiration rates change during the 24-hour period. (2 marks)

(c) Describe **two** possible reasons why the transpiration rates of the lucerne hay crop and the hydroponic tomatoes differ. (4 marks)

One: _____

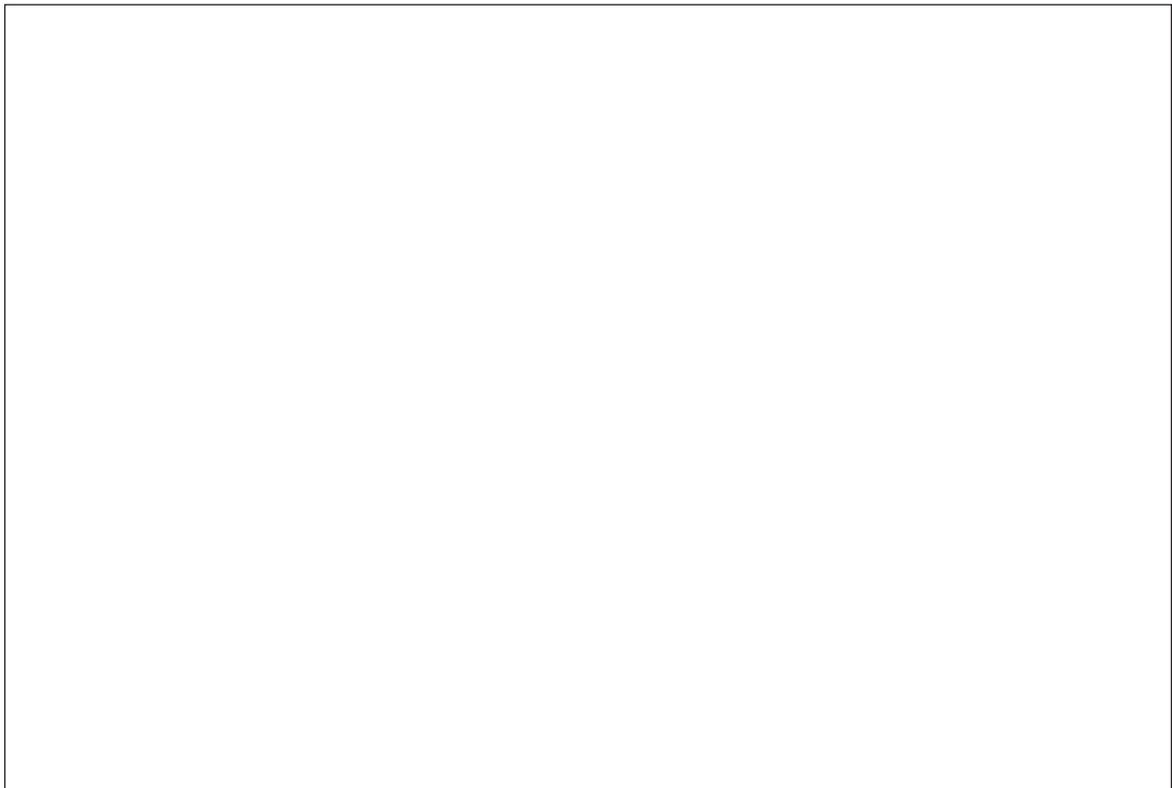
Two: _____

Question 21

(9 marks)

An understanding of the interactions between different ecosystems is important for sustainable agriculture.

- (a) In the space below, draw a diagram showing how energy from the sun is used in natural and agricultural ecosystems. Indicate in your diagram the flow of energy between these ecosystems. (5 marks)



- (b) Describe **two** benefits to plant production from the conservation of natural ecosystems. (4 marks)

One: _____

Two: _____

Question 22

(7 marks)

Compared with other countries, Australia has strict quarantine laws.

- (a) Describe **two** benefits of Australia's quarantine laws to plant producers. (4 marks)

One: _____

Two: _____

- (b) Use an example to demonstrate the importance of the global economy to plant producers in Australia. (3 marks)

End of Section Two

See next page

Section Three: Production practices

15% (32 Marks)

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

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

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Suggested working time: 30 minutes.

Question 23

(32 marks)

- (a) (i) For a plant production enterprise that you studied in 2015, name a required nutrient and describe the symptoms shown by the plant when a deficiency in that nutrient occurs. (3 marks)

Plant enterprise name: _____ (0 marks)

Required nutrient: _____

Deficiency symptoms: _____

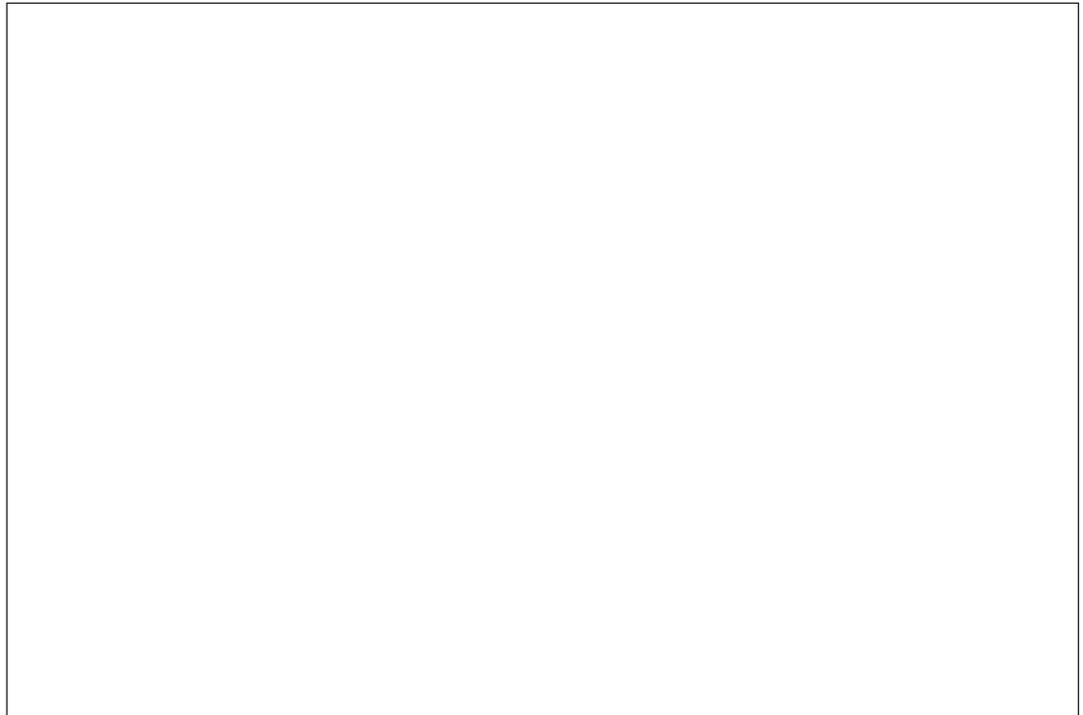
- (ii) Name a strategy to confirm a nutrient deficiency and explain how this strategy can assist you in managing your nutrition program. (3 marks)

- (iii) Describe **two** factors that could influence your decision to apply fertiliser to rectify the nutrient deficiency. (4 marks)

One: _____

Two: _____

- (b) (i) In the space below, draw a diagram of the production cycle for your enterprise. In your diagram link the life cycle of the plant to key management activities. (6 marks)



- (ii) Provide an example of a change in requirements for your plant that could occur during the production cycle and explain how you would manage this change. (3 marks)

Question 23 (continued)

- (c) Give an example of how your enterprise could affect the environment and explain why plant producers have a duty of care to the environment. (4 marks)

- (d) Name a common pest that presents a threat to your enterprise and compare the effectiveness of **two** different methods used to control it. (5 marks)

- (e) Describe **two** new varieties that could be developed for your plant: **one** that meets a specific market requirement and **one** for a specific environment. (4 marks)

New variety for a specific market requirement: _____

New variety for a specific environment: _____

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 on the lined pages provided following Question 26.

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: 40 minutes.

Question 24**(20 marks)**

Climate change and its potential impact on plant production is one of the major threats to the sustainability of agriculture.

- (a) Explain how human activity is related to climate change. Discuss **two** possible effects of climate change on plant production and propose an adaptation to production systems to minimise these effects. (11 marks)
- (b) Explain how climate change could affect the **three** factors of intergenerational equity. (9 marks)

Question 25**(20 marks)**

Plant producers rely on financial records and market information to guide management decisions.

- (a) Discuss **three** important budget items that have a significant effect on the gross margin for a plant enterprise. For each item, identify a possible risk that could influence profitability and present a strategy to minimise the risk to profitability. (15 marks)
- (b) Using a plant enterprise that you have studied, identify a possible change in consumer buying behaviour and explain how it could affect production. How could you manage your enterprise to maximise profitability in response to the change in consumer behaviour? (5 marks)

Question 26**(20 marks)**

To protect the future of Australian food production, pest management strategies need to minimise the potential for pesticide resistance.

- (a) For a plant enterprise that you have studied, identify a possible pest or disease outbreak that could be a serious threat to production. Present a pest management strategy to control the outbreak at local, national and international levels. (10 marks)
- (b) Using an example, demonstrate the link between pesticide 'modes of action' and the development of pesticide resistance. For a plant pest susceptible to resistance:
- propose a management strategy to avoid resistance occurring, and
 - a strategy to manage pesticide resistance if it does occur. (10 marks)

End of questions

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