



Western Australian Certificate of Education Examination, 2012

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 tape/fluid, 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 total exam
Section One: Multiple-choice	15	15	20	15	15
Section Two: Short answer	8	8	90	100	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 2012*. 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(s) 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.

1. A plant's transpiration system does **not** transport
 - (a) sugars.
 - (b) oxygen.
 - (c) water.
 - (d) carbon dioxide.

2. Stomata are **best** described as
 - (a) cell organelles involved in storage.
 - (b) root structures.
 - (c) pores on the leaf surface.
 - (d) fine leaves to reduce water loss.

3. A plant has the following symptoms; yellow old leaves, pale new leaves, stunted growth. The plant is most likely to be suffering from
 - (a) phosphorus deficiency.
 - (b) viral infection.
 - (c) water stress.
 - (d) nitrogen deficiency.

4. An example of a hormone based herbicide is
 - (a) Glyphosate.
 - (b) 2,4-D.
 - (c) Paraquat.
 - (d) Diuron.

5. Which of the following is **most** likely to increase nutrient pollution of waterways?
 - (a) split fertiliser applications
 - (b) top dressing at the break of season
 - (c) low solubility fertilisers
 - (d) improving soil organic matter

See next page

6. Quality assurance schemes
- (a) provide consumers with legal protection against faulty products.
 - (b) assist producers to determine what quantity to produce.
 - (c) provide confidence to consumers that products meet certain quality criteria.
 - (d) are used to pay producers different rates for different quality products.

Questions 7, 8 and 9 relate to the following information.

A pot trial was conducted to determine the growth rates of subclover under different temperature regimes. The data below represent the dry matter production (grams/pot) of five replicates of a particular treatment.

Replicate 1	Replicate 2	Replicate 3	Replicate 4	Replicate 5
17	21	18	25	20

7. The mean for the treatment is
- (a) 25.8.
 - (b) 17.3.
 - (c) 10.1.
 - (d) 20.2.
8. The standard deviation for the data in the pot trial is 3.3. What does this tell you about the raw data and the mean?
- (a) The mean is a reasonable representation of the raw data as all replicates fall within one standard deviation of the mean.
 - (b) The standard deviation is over 10 per cent of the mean, so the mean may not be a reliable representation of the raw data.
 - (c) The standard deviation is never a useful measure of how accurate the mean is as a representation of the raw data.
 - (d) Only Replicate 4 is questionable, as it falls outside one standard deviation of the mean.
9. In this experiment, the amount of dry matter produced is the
- (a) dependent variable.
 - (b) independent variable.
 - (c) control.
 - (d) hypothesis.

10. Which of the following statements are correct?

Plant tissue tests

- i. determine what nutrients are in the plant.
- ii. identify micronutrient levels in the soil.
- iii. provide a measure of soil pH.
- iv. are more useful than soil tests in hydroponic situations.

- (a) i, ii and iii
- (b) i and iv
- (c) iii and iv
- (d) i only

11. In order to interpret soil test results and develop a fertiliser program, which of the following additional information is required that is **not** contained in the soil test results?

- i. preferred level of production.
- ii. proposed crop type.
- iii. soil pH levels.
- iv. growing season rainfall.

- (a) i and ii
- (b) ii and iv
- (c) ii, iii and iv
- (d) i, ii and iv

12. Seed banks are

- (a) stores of genetic material for future breeding programs.
- (b) a proportion of harvested seed set aside for the next year's cropping program.
- (c) examples of small scale community banking institutions.
- (d) the amount of non-viable weed seed reserves in the soil.

13. Tissue culture

- (a) is a way of developing new plant varieties.
- (b) is a way of producing identical new plants.
- (c) relies on natural plant cross breeding processes.
- (d) enhances biodiversity in ecosystems.

14. Gross margins are a tool used to

- (a) compare the fixed costs of an enterprise from year to year.
- (b) compare the impact of management changes on profitability.
- (c) calculate how much money a farmer makes in a year.
- (d) calculate the profit and loss positions on single and multiple enterprises.

15. Sources of error in experiments are minimised by which combination of the following aspects of experimental design?
- i. replication
 - ii. randomisation
 - iii. control
 - iv. hypothesis
-
- (a) i and iii
 - (b) ii, iii and iv
 - (c) i and ii
 - (d) i, ii and iii

End of Section One

See next page

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Section Two: Short Answer

50% (100 Marks)

This section has **eight (8)** 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.

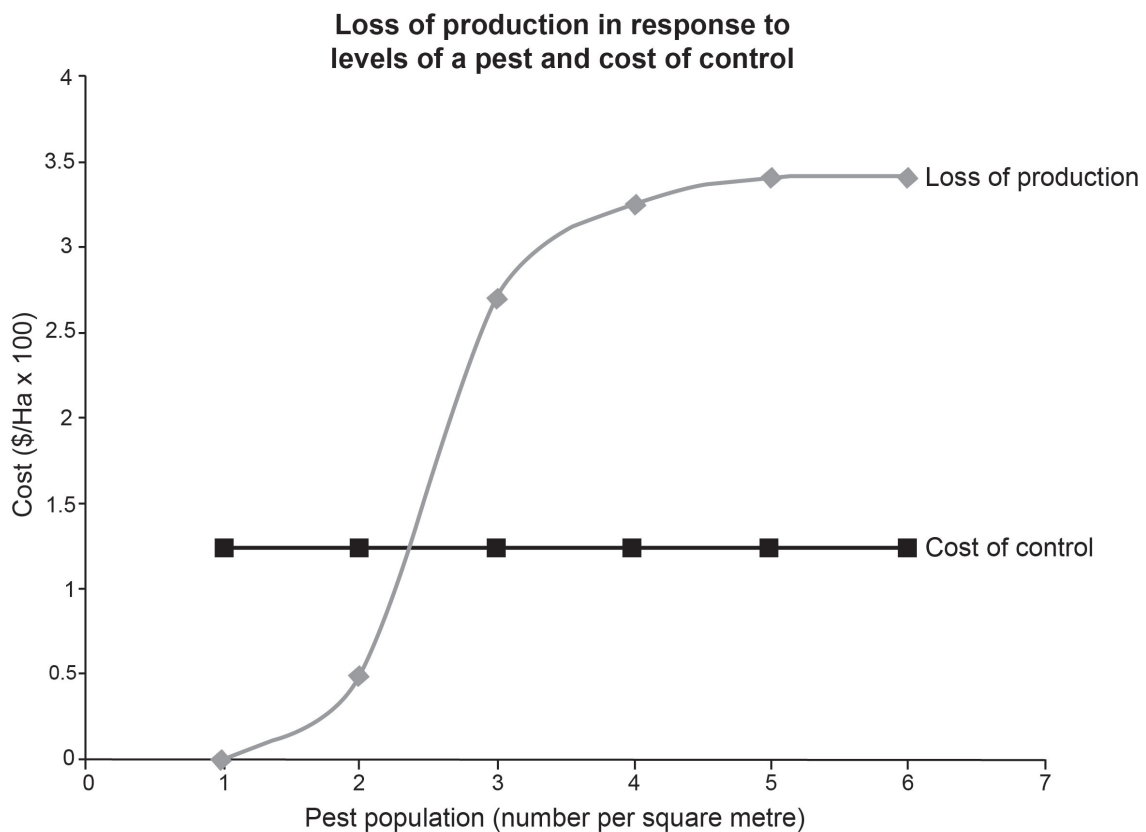
- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s)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

Suggested working time: 90 minutes.

Question 16

(13 marks)

The diagram below illustrates the value of lost production of a plant product in response to levels of a specific pest, as well as the cost of controlling that pest.



See next page

- (a) Define economic injury level. (2 marks)

- (b) Identify on the graph with the letters **EIL** the level of pest population that represents the economic injury level. (1 mark)

- (c) Define economic threshold. (2 marks)

- (d) Identify on the graph with the letters **ET** the level of the pest population that represents the economic threshold. (1 mark)

- (e) Explain why the value of lost production reaches a peak in the graph. (2 marks)

- (f) Explain why it is **not** always economical to treat a pest when it is first noticed in a crop and provide a specific example to illustrate your answer. (3 marks)

- (g) Explain **one** situation in which a pest may need to be controlled at any population level over zero. (2 marks)

Question 17

(15 marks)

Agriculture is becoming highly technical and plant producers need to keep up to date with new processes, varieties and resources.

- (a) Identify **one** new technology or innovation used in plant production. (1 mark)

- (b) Describe briefly the new technology. (2 marks)

- (c) Identify and describe what issue the new technology is attempting to address. (3 marks)

- (d) Identify the original technique or process that the new technology is replacing and explain how the new technology is an improvement. (3 marks)

(e) Justify how this new technology will improve farm sustainability. (3 marks)

(f) Identify and explain **one** barrier to the uptake of this technology by farmers. (3 marks)

Question 18

(15 marks)

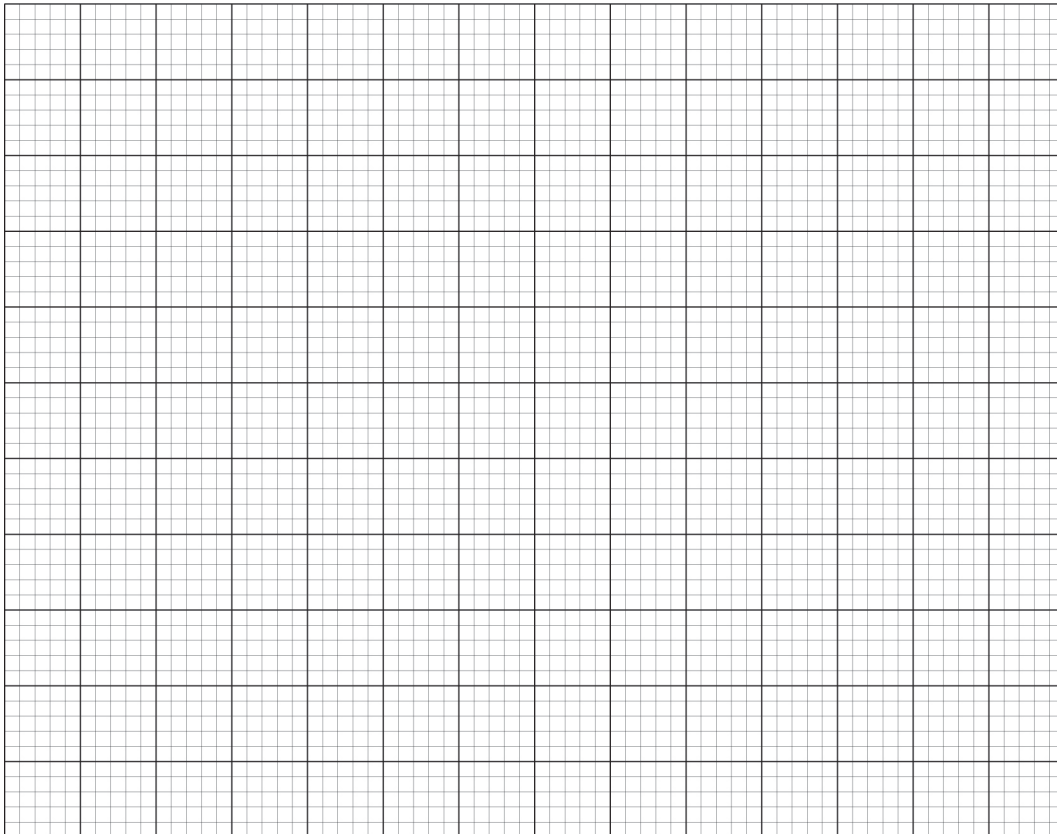
Root nematodes are pests living in the soil that damage plant roots and reduce yields by affecting water and nutrient uptake. An agricultural researcher suspects that root nematodes are advantaged by acidic soil conditions and establishes a pot trial to test his suspicions.

The results of the experiment are collected using the weight of root nodules as a measure of root nematode activity. A greater weight of root nodules indicates a higher level of nematode activity.

Soil pH	Weight of root nodules (g)
8.5	2.0
7.0	3.0
5.5	7.5
4.5	6.0
3.0	9.5

- (a) On the graph below, plot the weight of root nodules (g) against soil pH using the most appropriate graphing technique. (5 marks)

If you wish to have a second attempt at this graph, the grid is repeated on page 43 of this Question/Answer Booklet. Indicate clearly on this page if you have used the second grid and cancel the working on the grid on this page.



(b) What is your interpretation of the data?

(2 marks)

(c) Can a reliable conclusion be formulated from the data? Explain.

(3 marks)

(d) How would you improve this experiment to better investigate the researcher's suspicions?

(3 marks)

(e) How is standard deviation used to determine the validity of data? (2 marks)

Question 19**(13 marks)**

An understanding of the interaction between agricultural and natural ecosystems is important for the effective management of both.

(a) In the spaces below, draw **two** flow diagrams to illustrate the different flows of matter in natural and agricultural ecosystems.

(i) Natural: (5 marks)

(ii) Agricultural: (6 marks)

- (b) Using your understanding of energy flows in ecosystems, explain why it is more efficient to supply energy using plant-based foods than animal-based foods. (2 marks)

Question 20

(20 marks)

The development of new plant varieties has been an important agricultural activity for thousands of years and has led to improved production.

(a) Describe the process of developing a new plant variety using the following headings.

(i) Sourcing genetic material (2 marks)

(ii) Combining traits (2 marks)

(iii) Trialling (2 marks)

(iv) Releasing for commercial growing (2 marks)

(b) Genetic modification (GM) is a technique used to develop new plant varieties. Explain genetic modification using an example of a specific plant type and identify one specific characteristic it possesses. (4 marks)

(c) Explain **one** advantage and **one** disadvantage of GM.

(6 marks)

(d) Why does the use of GM technology present an ethical dilemma?

(2 marks)

Question 21

(9 marks)

Intergenerational equity relates to fairness between generations in relation to social, economic and environmental factors.

In the context of intergenerational equity, identify and describe an indicator for each factor that could be used to measure the sustainability of current agricultural practices.

(a) Social

(3 marks)

(b) Economic

(3 marks)

(c) Environmental

(3 marks)

Question 22

(6 marks)

Planning is an important aspect of successful business management and includes consideration of long-term and short-term goals.

- (a) Identify a short-term need and a long-term improvement of a farm resource and provide a measure that could be used to monitor the progress of each. (4 marks)

- (b) Explain why it is difficult to balance short-term needs with long-term improvements in resources. (2 marks)

Question 23

(9 marks)

Water is essential for plant growth and is a resource that plant producers aim to manage and optimise in the soil.

- (a) Identify and describe **one** soil factor that influences its water-holding capacity. (3 marks)

- (b) Explain **two** plant production practices, other than irrigation, that producers can use to maximise the availability of soil water. (6 marks)

Section Three: Production practices

15% (32 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 24.

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: 30 minutes.

Question 24

(32 marks)

For a plant type that you are familiar with, answer the following questions.

Plant type _____ (no marks)

- (a) For your plant type, explain the nutritional requirements at each of the **two** growth stages below and link them to physiological changes occurring at each stage. (8 marks)

Vegetative growth stage

The following questions relate to a plant pest that you are familiar with. You may refer to the plant type identified earlier in this question or another plant type.

- (d) Give an example of a plant pest that has developed pesticide resistance. (1 mark)

- (e) Explain how pesticide resistance developed in the pest population. (3 marks)

Question 26

(20 marks)

Climate change appears to be a feature of the environment to which farmers must adapt if they wish to remain productive and profitable.

- (a) Provide a description of climate change and outline **two** specific impacts of climate change on the climate patterns of the south-west of Western Australia. (8 marks)

(b) Identify and explain **two** strategies that Western Australian producers could adopt in order to remain profitable in the face of climate change. (6 marks)

(c) Climate change is also likely to have an affect on the natural environment. Explain how farmers are said to owe a duty of care to the natural environment. How might this work against farm profitability in the context of remaining viable in a changing climate? (6 marks)

Question 27

(20 marks)

Using the risk rating matrix below, answer the following questions for a specific plant production system with which you are familiar.

Probability	Consequences				
	Insignificant	Minor	Moderate	Major	Severe
Almost certain	M	H	H	E	E
Likely	M	M	H	H	E
Possible	L	M	M	H	E
Unlikely	L	M	M	M	H
Rare	L	L	M	M	H

L- Low risk M- Medium risk H- High risk E- Extreme risk

Plant production system _____ (no marks)

- (a) Identify **two** risks for your plant production system. For each risk, rate the probability and consequence and identify the overall risk rating. Explain what influenced your ratings. (10 marks)

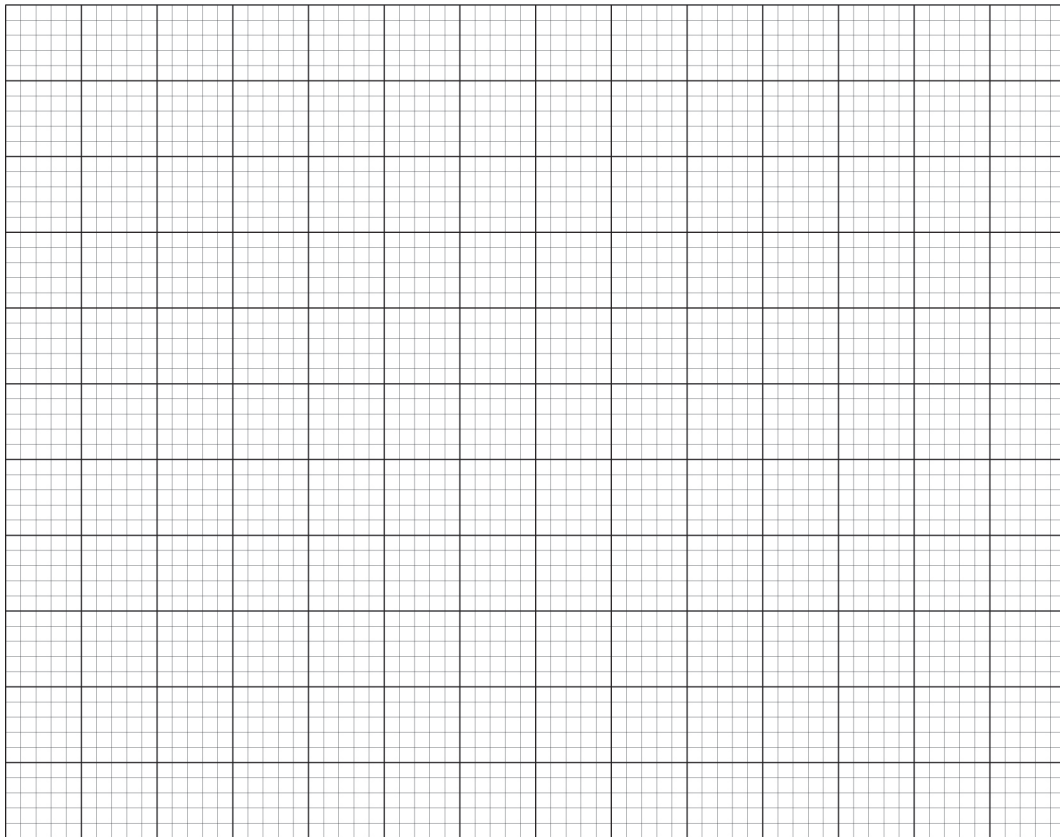
(b) How would you use the concept of overall risk rating to develop a risk management plan for an enterprise? List **two** items you would include in such a plan. (4 marks)

- (c) Explain the difference between risk avoidance and risk mitigation, using a specific example of each to illustrate your answer. (6 marks)

End of questions

Additional working space

Lined writing area consisting of 25 horizontal lines.



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