ANIMAL PRODUCTION SYSTEMS
Stage 3

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

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

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<th>Number of questions available</th>
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<th>Suggested working time (minutes)</th>
<th>Marks available</th>
<th>Percentage of exam</th>
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<td>40</td>
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<td><strong>100</strong></td>
<td></td>
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Instructions to candidates

1. 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.

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.
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. Which statement best describes ‘duty of care’ requirements?
   (a) The sole responsibility for ensuring a safe workplace belongs to the employer.
   (b) A safety induction is the only requirement.
   (c) Duty of care does not apply to everyone.
   (d) All individuals in the workplace have occupational health and safety responsibilities.

2. Ensuring that current practices do not affect the wellbeing of future generations is commonly known as
   (a) generational sustainability.
   (b) the triple bottom line.
   (c) intergenerational equity.
   (d) a positive feedback loop.

3. The end product of the digestive process converts sugars, starches and cellulose into
   (a) fatty acids.
   (b) amino acids.
   (c) ammonia.
   (d) microbial protein.

4. Which one of the following government measures works toward increasing Australia’s global competitiveness in livestock products?
   (a) import restrictions
   (b) trade agreements
   (c) import tariffs
   (d) market quotas

5. Gross margins should only be used to compare the profitability of similar enterprises, as they do not include
   (a) variable costs.
   (b) commodity prices.
   (c) fixed costs.
   (d) performance data.
6. An effective short-term conservation strategy is to

(a) implement a biosecurity plan.
(b) focus on improving production profitability.
(c) fence according to contours and soil types.
(d) diversify the enterprise mix.

Question 7 refers to the table below.

<table>
<thead>
<tr>
<th>Feed cost table</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On farm cost ($/t)</strong></td>
</tr>
<tr>
<td>Barley</td>
</tr>
<tr>
<td>Lupins</td>
</tr>
<tr>
<td>Oats</td>
</tr>
</tbody>
</table>

7. The order for the most cost effective feed type ($ per MJ/kg DM) to meet livestock energy requirements would be

(a) lupins, barley, oats.
(b) lupins, oats, barley.
(c) barley, oats, lupins.
(d) oats, lupins, barley.

8. Which of the following best explains why a producer should compare his own enterprise financial data with industry benchmarks?

(a) Ensure practices meet quality assurance requirements.
(b) Forecast future changes in market specifications of a product.
(c) Plan adequately for long-term environmental and financial sustainability.
(d) Identify the main factors that influence the financial performance of an enterprise.

9. A positive feedback loop occurs when

(a) outputs are fed back as inputs in an unstable system.
(b) outputs are fed back as inputs in a stable system.
(c) production practices have a negative impact on feedback loops.
(d) there is no relationship between inputs and outputs.

10. Which statement best describes a natural ecosystem?

(a) Undisturbed natural ecosystems are only able to maintain a limited sustainable diversity of life.
(b) Natural ecosystems have intricate recycling systems that are unable to conserve essential materials and nutrients.
(c) Natural ecosystems recycle materials including mineral nutrients and important biological substances.
(d) A natural ecosystem is a system in which energy but not matter passes through various cycles.
11. Which statement about an urban ecosystem is correct?

(a) The urban ecosystem has significantly lower soil contaminants than the natural environment.
(b) Acid rain is not a feature of air pollution in urban ecosystems.
(c) The urban ecosystem has significantly more air pollution, due primarily to industry.
(d) Recycling in an urban ecosystem is greater because of an increase in material available.

12. The best management strategy for avoiding pesticide resistance is to

(a) use a pesticide that increases the proportion of resistant individuals in the pest population.
(b) apply the same class of pesticide repeatedly to control the pest number.
(c) use a pesticide at predetermined dates in the calendar year to ensure the pest population is minimised.
(d) implement accepted management practices of an integrated pest management program.

13. Calculate the average weight gain per animal, per day for the following.

<table>
<thead>
<tr>
<th>Date</th>
<th>Animal A</th>
<th>Animal B</th>
</tr>
</thead>
<tbody>
<tr>
<td>08 March 2015</td>
<td>200</td>
<td>210</td>
</tr>
<tr>
<td>15 March 2015</td>
<td>211</td>
<td>219</td>
</tr>
</tbody>
</table>

(a) 1.25 kg
(b) 1.43 kg
(c) 4.71 kg
(d) 10.00 kg

14. A farmer is concerned about a variation in fleece weights at shearing time. After weighing all fleeces, what information should he look at to determine whether his concern is justified?

(a) mean and range
(b) mean and standard deviation
(c) median and standard deviation
(d) median and range

15. Which of the following is the most environmentally-sustainable means of disease control?

(a) IPM control
(b) quarantine
(c) chemical control
(d) cultural practices

End of Section One
This section has six (6) 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 (17 marks)

Budgets (partial and whole farm) and gross margins can be used to compare profitability across animal productions systems.

(a) List a benefit and a limitation of using partial budgets for financial analysis. (2 marks)

Benefit: ________________________________________________________________

Limitation: _____________________________________________________________

(b) A producer is contemplating an enterprise change by replacing 600 merino ewes with 50 beef cows. The following partial budget has been developed.

<table>
<thead>
<tr>
<th>Purchases required for the change</th>
<th>Purchase 50 cows</th>
<th>$45 000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase 1 bull</td>
<td>$5 000</td>
<td></td>
</tr>
<tr>
<td>Fence upgrade</td>
<td>$8 000</td>
<td></td>
</tr>
<tr>
<td>Sales to help fund the change</td>
<td>Less sale of 600 ewes</td>
<td>$8 000</td>
</tr>
<tr>
<td><strong>Net capital required</strong></td>
<td>(A)</td>
<td></td>
</tr>
<tr>
<td>Gross margin cows</td>
<td>$20 000</td>
<td></td>
</tr>
<tr>
<td>Gross margin ewes</td>
<td>$18 000</td>
<td></td>
</tr>
<tr>
<td><strong>Increase or decrease in income</strong></td>
<td>(B)</td>
<td></td>
</tr>
<tr>
<td><strong>Percentage return on extra capital</strong></td>
<td>(C)</td>
<td></td>
</tr>
</tbody>
</table>

(i) Calculate the missing information for A, B and C. (3 marks)

A: ________________________________________________________________

B: ________________________________________________________________

C: ________________________________________________________________
(ii) What additional factors would the producer need to consider to ensure that there was a valid comparison between the enterprise gross margins in part (b)(i)?

(2 marks)

(iii) On the basis of the analysis of the partial budget in part (b)(i), explain what recommendation you would give to the producer.

(2 marks)

(c) Name two export market conditions that could have an impact on projected enterprise incomes and explain their effects.

(4 marks)

One: 

Explanation:

Two: 

Explanation:
Question 16 (continued)

(d) Describe two possible strategies available to the producer to address the risk of fluctuations in product price. (4 marks)

One: ____________________________________________________________

Two: ____________________________________________________________

Question 17 (15 marks)

The selection and mating of genetically-superior animals is an essential component of successful breeding programs.

(a) (i) Identify two methods of selecting genetically-superior animals. (2 marks)

One: ____________________________________________________________

Two: ____________________________________________________________

(ii) Define ‘heritability’ and, using an example, describe how an understanding of heritability can assist genetic improvement. (4 marks)

______________________________________________________________

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(b) A commercial prime lamb producer has identified two suitable rams to purchase. The only information available is the following estimated breeding values (EBVs).

Ram A: Growth (kg) EBV +6
Ram B: Growth (kg) EBV +4

(i) Calculate the estimated gain in the progeny for each ram. (2 marks)

Ram A: 

Ram B: 

(ii) Assuming each ram will mate with 50 ewes (100% lambing), calculate the potential difference in income between each ram if the market price for lamb is $5/kg. Show all workings. (3 marks)

(iii) Discuss, using two examples, how EBVs can assist in meeting market specifications. (4 marks)
Australia’s comparative advantage in livestock production means that it has been successful in establishing and maintaining export markets.

(a) (i) List two factors that contribute to Australia’s comparative advantage and identify an international market in which this applies. (3 marks)

One: __________________________________________________________________________

Two: __________________________________________________________________________

Market: ________________________________________________________________________

(ii) Explain two ways in which the Australian Government can assist in developing or maintaining agricultural animal export markets. (4 marks)

One: __________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

Two: __________________________________________________________________________

_______________________________________________________________________________

_______________________________________________________________________________

(b) Discuss, using an example, how changes in productivity have contributed to Australia’s global competitiveness in livestock products. (3 marks)

_______________________________________________________________________________

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_______________________________________________________________________________
(c)  (i) Name a significant infectious livestock disease and outline the consequences of an outbreak, both locally and at the international level. (3 marks)

<table>
<thead>
<tr>
<th>Disease</th>
<th>Consequence of outbreak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Local level</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) Outline two ways in which Australia's biosecurity system is designed to reduce the likelihood of an infectious disease outbreak for each of the given levels. (4 marks)

Australian Government (international) biosecurity measures:

One: ____________________________________________

Two: ____________________________________________

Individual farm (local) biosecurity measures:

One: ____________________________________________

Two: ____________________________________________
All animals have a natural disease control system that varies in complexity and effectiveness.

(a) Outline the function of the immune system.

(b) Define ‘antigen’ and ‘antibody’.

(c) (i) Discuss one reason why colostrum is important for a young animal in the first few hours of birth.

(ii) What may happen if the newborn animal receives no colostrum from its mother?
(iii) What management strategy could the farmer use to address the possible outcome in part (c)(ii)? (2 marks)

(d) Why is a booster required when vaccinating young stock? What impacts on production would there be if the producer did not vaccinate his stock in the short and long term? (6 marks)

Reason for booster: ________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________

Short-term impact: ________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________

Long-term impact: ________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________

(e) Discuss one social and one economic issue that would affect a producer’s decision to use a new animal health medication within an enterprise. (4 marks)

Social issue: ____________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________

Economic issue: _________________________________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________
The presence of pests in an animal production system can affect the quality of any marketed product and result in a decrease in price.

(a) Explain, using an example, how the producer can implement measures to control a pest on the basis of the economic injury level (EIL) strategy. (3 marks)

(b) Describe the difference between contact and systemic modes of action. (4 marks)

Contact:

Systemic:

(c) For one of the modes of action in part (b), list one advantage and one disadvantage related to pest control. (2 marks)

Advantage:

Disadvantage:
(d) Explain what is meant by the term 'pesticide resistance'.

(2 marks)

(e) List two methods available to the producer to avoid or limit the impact of a pest.

(2 marks)

One: ____________________________________________________________

______________________________________________________________

Two: ___________________________________________________________

______________________________________________________________

(f) Discuss an integrated approach to the control of a selected pest in an animal production system.

(4 marks)

Selected pest: ___________________________________________________ (no marks)

IPM strategy: ____________________________________________________

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________________________________________________________________
A producer believes she has a worm resistance problem on her farm. She conducts a trial comparing two drenches on 30 animals of various breeds, age, weight and different management groups. The animals are split into two equal groups with one type of drench used in each group.

Note: any egg count greater than 300 affects production.

### Faecal egg counts (average per animal) for two drench types over time

<table>
<thead>
<tr>
<th>Month</th>
<th>Drench – A Clear</th>
<th>Drench – B Combination</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 2014</td>
<td>1200</td>
<td>1150</td>
</tr>
<tr>
<td>February 2015</td>
<td>300</td>
<td>1500</td>
</tr>
<tr>
<td>April 2015</td>
<td>200</td>
<td>550</td>
</tr>
<tr>
<td>June 2015</td>
<td>200</td>
<td>450</td>
</tr>
<tr>
<td>August 2015</td>
<td>600</td>
<td>300</td>
</tr>
</tbody>
</table>

(a) Write an hypothesis for this trial. (2 marks)

(b) Identify and explain one variable that you could use to decrease the error in this trial. (2 marks)
(c) Use the information from the drenches trial to draw graphs showing the results of the two drenches. (6 marks)

A spare grid is provided at the end of the Question/Answer Booklet. If you need to use it, cross out this attempt.

(d) Outline the conclusion that can be drawn from these results. (2 marks)

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End of Section Two

See next page
Question 22  (26 marks)

The sustainability of a farm enterprise relies on the application of knowledge and skills to optimise production.

Name an animal production enterprise you have studied this year and state its marketed product.

Animal production enterprise: _______________________________ (no marks)
Marketed product: _______________________________ (no marks)

(a) (i) Identify a relevant quality assurance program for the marketed product and outline two of its quality assurance criteria. (5 marks)

Quality assurance program: _______________________________

Criterion one: _______________________________

Criterion two: _______________________________
(ii) Describe two factors that may influence a producer’s decision to implement a quality assurance system. (4 marks)

One: 

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

Two: 

________________________________________________________________________

________________________________________________________________________

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(b) If changes in the market result in consumers demanding leaner carcasses, outline how a livestock manager could address this change through: (9 marks)

breeding 

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

nutrition 

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________________________________________________________________________

________________________________________________________________________

technology. 

________________________________________________________________________

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________________________________________________________________________
Question 22 (continued)

(c) Balancing short-term needs with long-term sustainability is a dilemma faced by livestock producers.

(i) Describe two ways in which a livestock producer could achieve a short-term goal of increased profit while also working toward a long-term goal of social sustainability. (4 marks)

One: ______________________________________________________

________________________________________________________

________________________________________________________

Two: ______________________________________________________

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________________________________________________________

(ii) Outline the importance of balancing triple bottom line sustainability to an animal production business. (4 marks)

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End of Section Three
Question 23  (20 marks)

In the last decade, large proportions of Australia’s agricultural regions have endured extended dry conditions.

(a) Livestock producers must address the following challenges when experiencing extended dry conditions:
   - economic sustainability
   - maintenance feeding.

Discuss these challenges and how they can be addressed. (8 marks)

(b) Explain the principles of production feeding. Your response must include
   - how feed additives and hormone growth promotants (HGPs) could be of assistance. Include two specific examples.
   - the legal requirements associated with using HGPs. (12 marks)

Question 24  (20 marks)

(a) Explain the potential costs and benefits of two breeding technologies compared with conventional breeding systems. Identify how the new technologies may be evaluated in terms of optimising production. (12 marks)

(b) If producers are unable to access advances in breeding technology, outline two management practices that could be implemented to optimise production. (8 marks)

Question 25  (20 marks)

(a) Explain the energy flow (Gross energy to Net energy) in a digestive system of an animal you have studied. How is the management of energy flow critical to the animal's performance? (8 marks)

(b) The rumen is essential for feed conversion. Outline how optimum feed conversion is achieved. Explain the digestive process in terms of the following:
   - protein digestion in the rumen
   - carbohydrate digestion in the rumen. (12 marks)

End of questions
Question number: ________________
Question number: ____________

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Additional working space

Question number: _______________
Spare grid.
ACKNOWLEDGEMENTS

Section Two