



## ATAR course examination, 2017

### Question/Answer booklet

# ANIMAL PRODUCTION SYSTEMS

Please place your student identification label in this box

Student number: In figures

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In words

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### Time allowed for this paper

Reading time before commencing work: ten minutes

Working time: 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 this examination

### 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 material. 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 examination
Section One Multiple-choice	20	20	30	20	20
Section Two Short answer	7	7	90	93	50
Section Three Extended answer	3	2	60	40	30
<b>Total</b>					100

## Instructions to candidates

- The rules for the conduct of the Western Australian external examinations are detailed in the *Year 12 Information Handbook 2017*. 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 and Three: Write your answers in this Question/Answer booklet.

- You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question.
- Supplementary pages for the use of planning/continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

**Section One: Multiple-choice****20% (20 Marks)**

This section has **20** 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: 30 minutes.

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1. A control
  - (a) influences the treatment within an experiment.
  - (b) is the variable that you measure or observe.
  - (c) does not change throughout an experiment.
  - (d) is the one condition that you change in an experiment.
  
2. The most effective long-term method of reducing product variations within a breed is by
  - (a) using a natural breeding program.
  - (b) maintaining accurate pedigrees.
  - (c) utilising estimated breeding values.
  - (d) using objective measurement.
  
3. To ensure ongoing compliance with a quality assurance program, a producer should
  - (a) conduct regular on-farm audits.
  - (b) analyse key profitability data.
  - (c) evaluate trends in market reports.
  - (d) adopt new technologies.
  
4. A valid comparison of the environmental impact of different chemicals used to control pests is
  - (a) dosage cost.
  - (b) residual value.
  - (c) withholding period.
  - (d) dosage rate.
  
5. Which statement about hormone growth promotants is **false**?

Hormone growth promotants

  - (a) improve feed conversion efficiency.
  - (b) increase growth rate.
  - (c) delay fat deposition.
  - (d) increase disease resistance.

**See next page**

6. Which one of the following strategies helps to maintain Australia's global competitiveness?
- (a) new technologies in competitor countries
  - (b) strict quarantine laws in Australia
  - (c) quota restrictions in Australia
  - (d) government subsidies in competitor countries
7. Free-range products are gaining popularity because
- (a) the low cost of production is passed on to the consumers.
  - (b) producers are complying with animal activists' demands.
  - (c) producers are responding to changing consumer trends.
  - (d) consumers are demanding locally grown products.
8. Producers can make use of market information to
- (a) be assured of high prices.
  - (b) plan their production and marketing.
  - (c) take the risk avoidance out of farming.
  - (d) force buyers to increase the price paid.
9. To achieve a fat score that meets market specifications, which part of the ration needs to be monitored closely?
- (a) protein
  - (b) fibre
  - (c) minerals
  - (d) energy
10. Farmers today need to ensure that their practices do not compromise the wellbeing of future generations. This statement refers to
- (a) intergenerational equity.
  - (b) the triple bottom line.
  - (c) generational sustainability.
  - (d) risk management.
11. The most effective method of comparing the profitability of enterprises that use similar resources is a
- (a) partial budget.
  - (b) cash flow budget.
  - (c) gross margin.
  - (d) whole farm budget.

12. In a data set, standard deviation is used to
- (a) determine standard error.
  - (b) calculate the mean.
  - (c) derive the range.
  - (d) estimate probability.
13. Experimental bias can be caused by
- (a) government funding of research.
  - (b) the use of specialised equipment.
  - (c) possible researcher prejudice.
  - (d) the incorporation of a control variable.
14. Duty of care ensures
- (a) intergenerational equity.
  - (b) animal welfare requirements are met.
  - (c) safe working environments.
  - (d) product quality assurance.
15. Which one of the following is the **most** suitable application of a pedigree?
- (a) estimated breeding value on the basis of parentage
  - (b) combining performance and breed type data
  - (c) concentrating only on the sires being used
  - (d) mapping heritability traits among generations
16. Conservation of biodiversity is **not** improved by?
- (a) increased invasive species
  - (b) restoring natural ecosystems
  - (c) increasing native habitats
  - (d) reducing introduced species
17. Breeding technologies have had a significant impact on
- (a) improving conception rates.
  - (b) reducing venereal diseases.
  - (c) improving genetic gains.
  - (d) reducing breeding costs.
18. Forward contracts for livestock are an example of risk
- (a) avoidance.
  - (b) mitigation.
  - (c) consequence.
  - (d) probability.

19. Managing the conflicting demands of a business with regard to social, environmental and economic factors is best known as
- (a) intergenerational equity.
  - (b) risk assessment.
  - (c) the triple bottom line.
  - (d) the setting of benchmarks.
20. An agricultural ecosystem has higher \_\_\_\_\_ than a natural ecosystem.
- (a) nutrient recycling
  - (b) productivity
  - (c) genetic diversity
  - (d) sustainability

**End of Section One**

**See next page**

## Section Two: Short answer

50% (93 Marks)

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

Supplementary pages for the use of planning/continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Suggested working time: 90 minutes.

## Question 21

(14 marks)

The following table represents a financial statement for a feedlot that delivers steers directly to an export abattoir. Half of the steers have had no treatments (herd A) while the other half of the steers have been treated with a Hormonal Growth Promotant (HGP) implant (herd B).

Income	Number of steers	Average weight kgs/head	\$/kg live weight	\$/head	No HGP implant (herd A)	HGP implant (herd B)
	100	320	3	960	\$96 000	
	100	350	3	1050		\$105 000
<b>Costs</b>						
Feed					\$30 000	\$30 000
Drench					\$ 500	\$ 500
Ear tags					\$ 300	\$ 300
Vaccine					\$ 200	\$ 200
Cartage					\$ 1000	\$ 1000
Labour					\$ 5000	\$ 6000
HGP implant					\$ 0	\$ 2000
					<b>\$37 000</b>	<b>\$40 000</b>
<b>NET PROFIT</b>					<b>A</b>	<b>B</b>

(a) (i) Use the information in the table above to calculate (2 marks)

A: \_\_\_\_\_

B: \_\_\_\_\_

(ii) Which herd of steers is the most profitable? (1 mark)

\_\_\_\_\_

See next page

**Question 21** (continued)

- (b) (i) If the abattoir was willing to pay only \$2.70/kg live weight for HGP treated steers, would it still be as profitable to use HGP implants? Show all workings. (2 marks)

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- (ii) Describe why the abattoir would pay less for steers treated with HGP implants? (2 marks)

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The feedlot has a choice between two feed rations, A and B.

Ration A is barley and oaten hay with a crude protein content of 15%. It costs \$184/tonne.

Ration B is lupins and oaten hay with the same crude protein level.

The nutritional values and cost/tonne of barley, lupins and hay are provided below.

Barley has 16% crude protein and costs \$200/tonne.

Lupins have 25% crude protein and cost \$300/tonne.

Oaten hay has 10% crude protein and costs \$100/tonne.

- (c) (i) Using the Pearson Square method, calculate Ration B and compare its cost to that of Ration A. State which is the least cost ration. Show all workings. (5 marks)

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- (ii) What legal requirements do you need to adhere to when selecting ingredients to make up a ruminant feed ration? (2 marks)

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Question 22

(15 marks)

The use of drench to control worms continually faces issues of resistance.

- (a) If livestock producers follow the labelled directions on drenches accurately, describe why resistance still occurs? (2 marks)

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- (b) Describe **two** strategies a producer can use to reduce resistance to drenching. (4 marks)

One: \_\_\_\_\_

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Two: \_\_\_\_\_

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- (c) State the difference between systemic and contact modes of action. (2 marks)

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- (d) Given the choice between a systemic and a contact chemical to control an external parasite, which would be more effective against the parasite? State your reason. (2 marks)

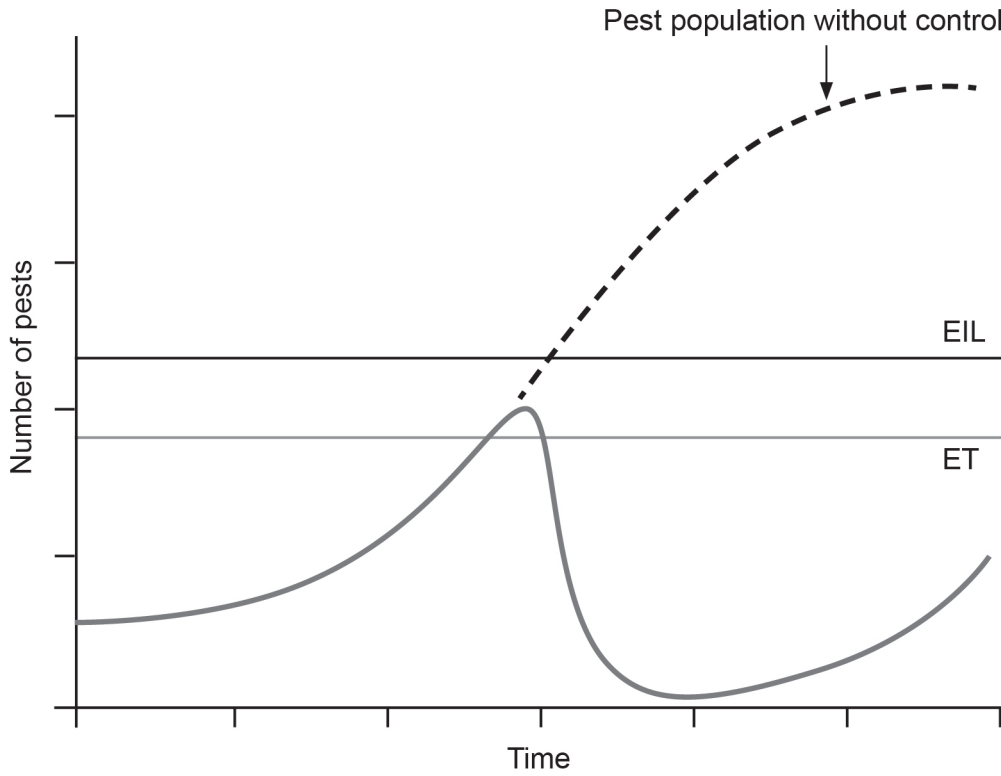
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- (e) (i) Using the diagram provided below, explain the relationship between Economic Injury Level (EIL) and Economic Threshold (ET) as it applies to decisions that are made about pest control. (4 marks)




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- (ii) On the pest population line in the diagram above, show with an 'X' when the control should be implemented. (1 mark)

Question 23

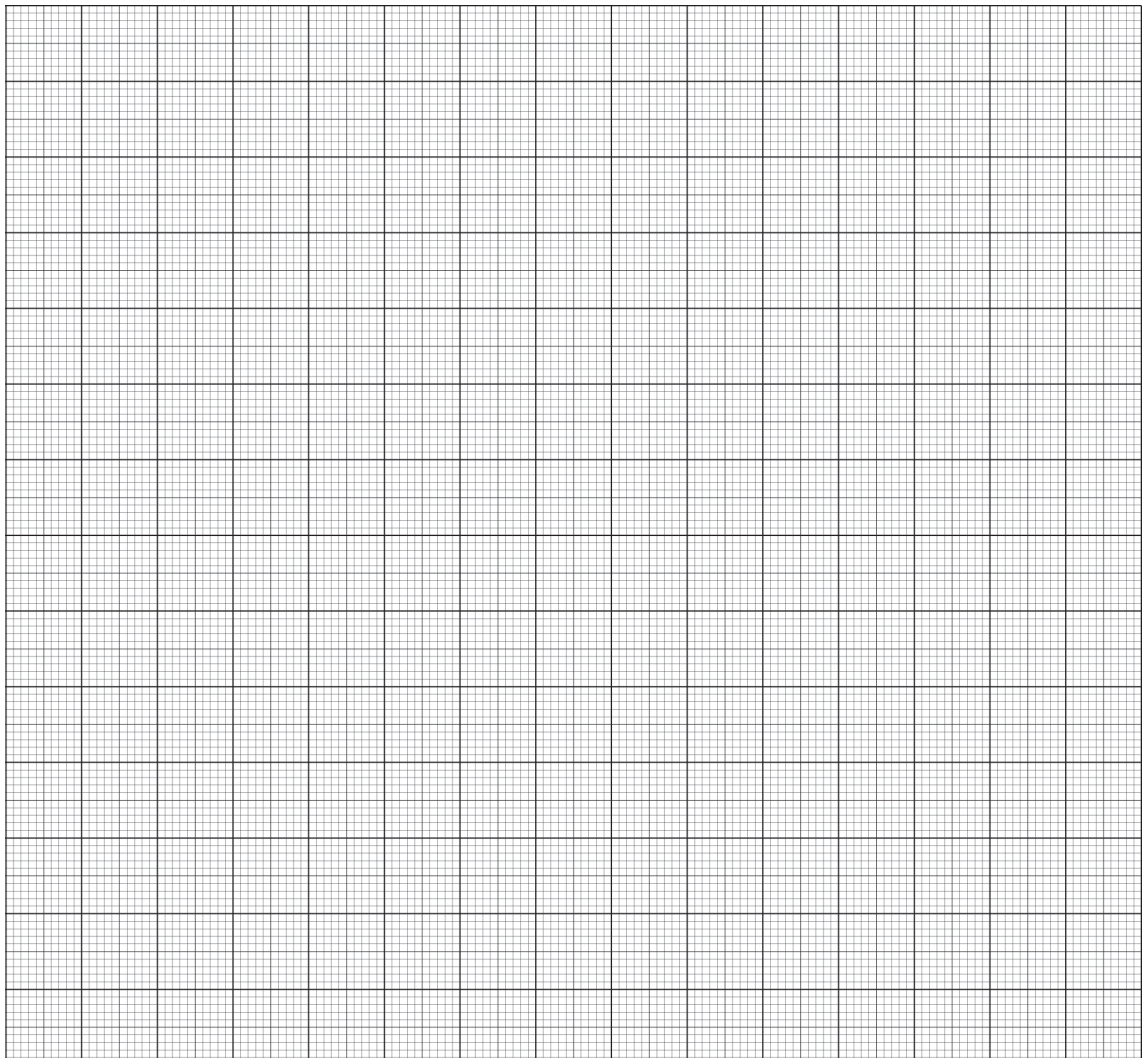
(13 marks)

The average Estimated Breeding Value (EBV) trends of a breed over a 15 year period have been recorded in the table below.

Birth year	Birth weight (kg)	400 day weight (kg)	Mature female weight (kg)
2000	+2	+20	+30
2005	+2	+30	+40
2010	+3	+40	+50
2015	+3	+55	+65

(a) Graph the EBV trends for this breed.

(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.

See next page

- (b) Analyse the EBV trends in part (a) and interpret how they could be utilised by producers. (4 marks)

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- (c) List **one** breeding technology and describe how it can assist in meeting market specifications. (3 marks)

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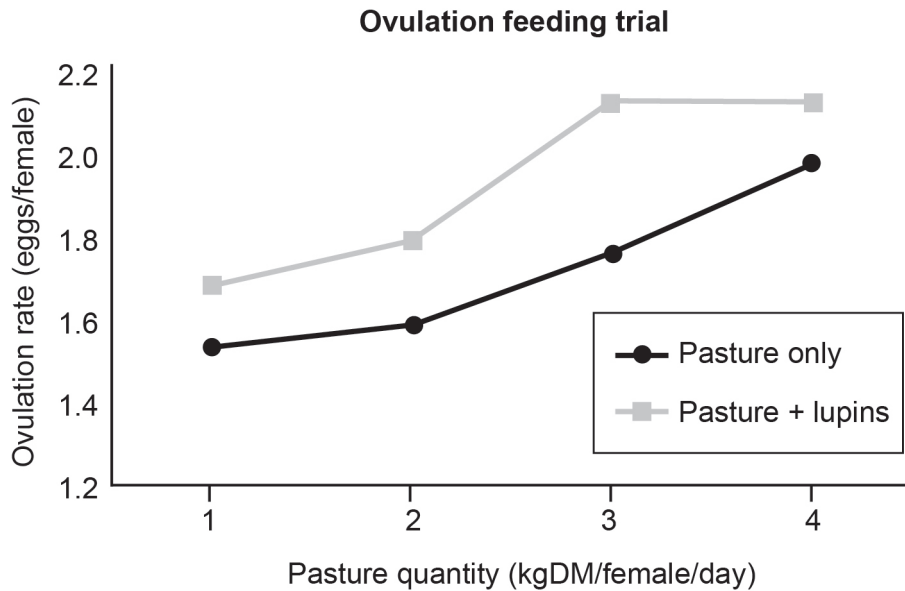
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Question 24

(12 marks)

Flushing is a common practice in many animal production systems and involves the additional feed of lupins to increase ovulation rates.

A flushing trial was conducted over a five-week period to test the ovulation rates of breeding animals exposed to four different pasture quantities, with and without supplemented lupins. The results are represented in the following graph:



(a) (i) State an hypothesis for this trial. (2 marks)

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(ii) Discuss the results of the trial and their importance to a breeding program. (4 marks)

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- (b) Describe the importance of randomisation and replication in ensuring results of this trial are valid. (4 marks)

Randomisation: \_\_\_\_\_

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Replication: \_\_\_\_\_

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- (c) Outline an alternative variable that is linked to ovulation rates and would provide useful data for a breeding program. (2 marks)

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## Question 25

(13 marks)

Heritability and breed performance criteria are now playing a larger role in the selection of sires for breeding programs.

- (a) Describe how heritability can impact genetic gain? (2 marks)

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A producer's breeding goal is to improve the daily live weight gain of cattle.

**Daily live weight gain of cattle**

<b>Cattle</b>	<b>kg/hd/day</b>
Herd average	1.5 kg
Dam	1.8 kg
Sire	2.0 kg

The heritability estimate for live weight gain is 0.45.

- (b) Using the information provided above
- (i) calculate the genetic gain passed on by the parents. (1 mark)

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- (ii) calculate the expected gain based on heritability. (1 mark)

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- (iii) calculate the expected gain of the offspring. (1 mark)

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**See next page**



- (c) State whether the joining of the proposed sire and dam would assist the producer in achieving the breeding goal to improve the daily weight gain of cattle. Justify your response. (3 marks)

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A producer has to choose between two potential bulls, A and B. Both have a positive estimate for eye muscle area.

**Estimated breeding values (EBV) and accuracies (%)**

Bull	Carcase weight		Eye muscle area		Intra muscular fat	
	kg	Accuracy	cm <sup>2</sup>	Accuracy	mm	Accuracy
A	+61	87%	+8.8	85%	+0.3	85%
B	+66	77%	+9	66%	+0.4	82%
<b>Breed average</b>	<b>+56</b>		<b>+4.6</b>		<b>+1.6</b>	

- (d) (i) Using the EBV provided in the table above, calculate the estimated genetic gain in eye muscle area in the progeny of both bulls. (2 marks)

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- (ii) Based on the information calculated in part (d)(i) and the table, which bull would be the better option for beef production? Justify your response. (3 marks)

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Question 26

(16 marks)

Producers often use natural and artificial techniques to manipulate the breeding cycles of livestock.

- (a) (i) List **two** hormones that are used in an oestrous synchronisation program. (2 marks)

One: \_\_\_\_\_

Two: \_\_\_\_\_

- (ii) Describe the role of the **two** hormones you listed in part (a)(i) when they are used in an oestrous synchronisation program. (4 marks)

One: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Two: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- (b) Describe **two** advantages of an oestrous synchronisation program. (4 marks)

One: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Two: \_\_\_\_\_

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- (c) Explain **one** artificial method that can be used to manipulate the breeding cycle. (3 marks)

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- (d) Explain a potential ethical issue associated with an artificial breeding technology. (3 marks)

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**Question 27**

**(10 marks)**

- (a) Explain why it is important for producers to have a sound understanding of the digestive systems of livestock. (3 marks)

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- (b) (i) Outline how proteins are utilised by livestock. (2 marks)

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- (ii) Outline how carbohydrates are utilised by livestock. (2 marks)

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- (c) Explain how microbial and gastric digestive systems differ in their ability to digest proteins. (3 marks)

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**End of Section Two**

**See next page**

**Section Three: Extended answer**

**30% (40 Marks)**

This section contains **three (3)** questions. You must answer **two (2)** questions: the compulsory question (Question 28) and **one (1)** of the other questions (Question 29 or Question 30). For Question 28, write your answer in the spaces provided. For Question 29 or Question 30 write your answers on the lined pages following Question 30.

Supplementary pages for the use of planning/continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.

Suggested working time: 60 minutes.

**Question 28**

**(20 marks)**

This compulsory question must refer to **one** animal enterprise you studied during the year.

Animal enterprise: \_\_\_\_\_ (0 marks allocated)

Marketable product: \_\_\_\_\_ (0 marks allocated)

- (a) Explain the market requirements for your enterprise's marketable product and how these requirements can affect financial returns. (5 marks)

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**Question 28** (continued)

- (b) Explain how each of the factors below could negatively affect the enterprise's ability to meet the market requirements identified in part (a): (9 marks)
- nutrition
  - handling and transport
  - weather.

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- (c) Explain how your nominated enterprise could alter its operation to
- meet changing circumstances
  - improve its efficiency.

(6 marks)

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**Question 29****(20 marks)**

Climate change could have a significant impact on animal production systems.

- (a) Explain **two** potential impacts that climate change could have on an animal production system and how this could affect sustainability. (10 marks)
  
- (b) In planning for sustainability, explain the short-term and long-term strategies that animal producers could implement in their production systems in order to respond to the impacts of climate change. (10 marks)

**or**

**Question 30****(20 marks)**

To have a strong agricultural sector, Australia needs to be more competitive.

- (a) Select **one** Australian animal export and state its major market. Explain the strategies Australia has in place to maintain this market at the international, national and farm levels. (11 marks)
  
- (b) Identify a market in which Australia has a comparative advantage for an animal product and explain why this exists. Discuss the advantages and disadvantages of introducing tariffs to protect this market. (9 marks)







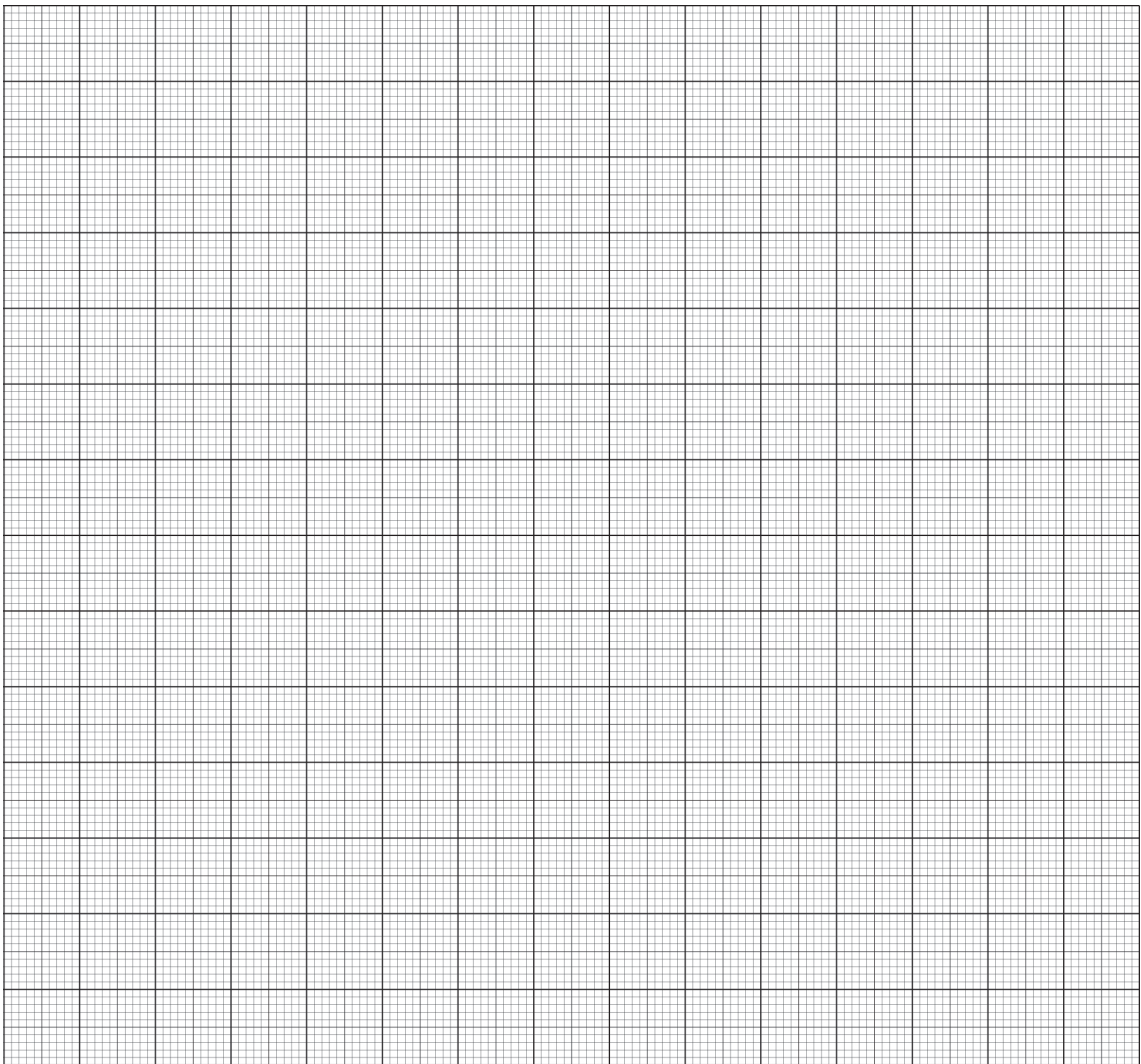








Spare grid



## ACKNOWLEDGEMENTS

**Question 22(e)** Graph adapted from: Barbercheck, M. E., & Zaborski, E. (2011). *Insect pest management: Differences between conventional and organic farming systems* (Fig. 1). Retrieved July, 2017, from [www.extension.org/pages/19915/insect-pest-management:-differences-between-conventional-and-organic-farming-systems#.VWVleU3vrCs](http://www.extension.org/pages/19915/insect-pest-management:-differences-between-conventional-and-organic-farming-systems#.VWVleU3vrCs)  
Figure credit: Ed Zaborski, University of Illinois.

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