2025/4394
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Government of **Western Australia**
School Curriculum and Standards Authority

ATAR course examination, 2024

Question/Answer booklet

ANIMAL PRODUCTION SYSTEMS

Please place your student identification label in this box

WA student number: In figures | | | | | | | | | |

In words _____

_____

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: up to three calculators, which do not have the capacity to create or store programmes or text, are permitted in this ATAR course 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	6	6	90	103	50
Section Three Extended answer	3	2	60	40	30
				Total	100

Instructions to candidates

1. The rules for the conduct of the Western Australian external examinations are detailed in the *Year 12 Information Handbook 2024: Part II Examinations*. 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. Do not use erasable or gel pens. 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 preferably using a blue/black pen. Do not use erasable or gel pens.

3. 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.

4. Supplementary pages for planning/continuing your answers to questions are 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.

See next page

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. Do not use erasable or gel pens. 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. Which of the following reproductive hormones is stored in the pituitary gland?

   (a) oestrogen
   (b) oxytocin
   (c) testosterone
   (d) endocrine

2. Which of the following is used to ensure lifetime traceability in animal production systems?

   (a) National Livestock Identification System (NLIS)
   (b) Meat Standards Australia (MSA)
   (c) Animal Lifecycle Monitoring System (ALMS)
   (d) National Vendor Declaration (NVD)

3. Which of the following strategies is effective in mitigating the development of pesticide resistance in livestock?

   (a) increasing the frequency of pesticide applications
   (b) repeating the same pesticide at higher doses
   (c) implementing a strategic rotation of pesticides
   (d) focusing specifically on chemical methods

4. What do the prefixes B, W and P represent in estimated breeding values?

   (a) birth weight, weaning weight and post-weaning weight
   (b) before weight, weight and post weight
   (c) birth weight, weight and prime percentage weight
   (d) below weight, weaning and paternal weight

See next page

Questions 5 and 6 are based on the table below.

Beef production	
Category	**Amount ($)**
Revenue	
Sales of beef	150 000
Expenses	
Purchase of calves	50 000
Feed	25 000
Veterinary expenses	5 000

5. Calculate the gross margin for beef production.

(a) $20 000
(b) $70 000
(c) $80 000
(d) $230 000

6. The producer can change to a different breed of cattle in this system. They estimate that, using the new breed, purchase of calves and feed will increase by 10%, and they will receive $10 000 more in sales. Which of the following would be the **most** reasonable recommendation?

(a) do not change breeds as gross margin would be lower
(b) change breeds as revenue would be higher
(c) do not change breeds as expenses would be higher
(d) change breeds as gross margin would be higher

7. Which of the following is **least** likely to affect product quality in an intensive farming system?

(a) breed selection
(b) feed nutrition
(c) water salinity
(d) local climate

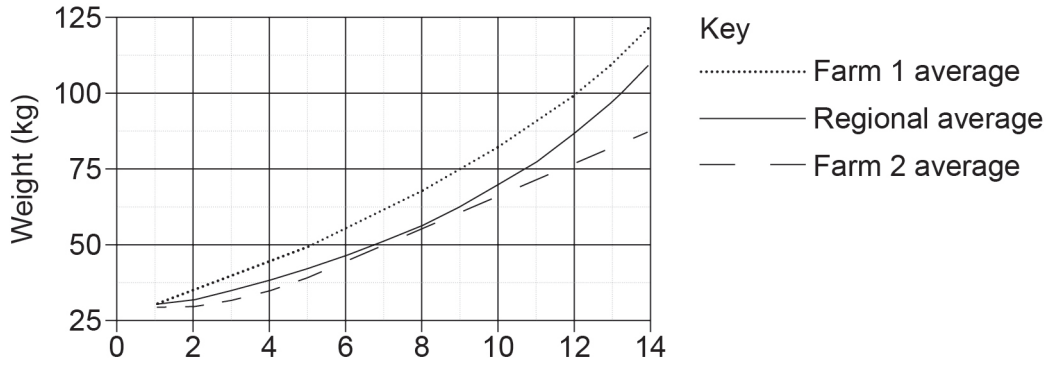
8. How does product quality variation impact the financial return for a livestock system?

(a) has no effect on financial return as they have been budgeted for
(b) may lead to increased financial return due to a diverse range of meat products
(c) can result in decreased financial return as buyers prefer consistent products
(d) only affects the visual appeal of meat, with no impact on financial outcomes

See next page

Use the information in the graph below to answer Questions 9 to 11.

Growth curves for cattle at two farms



9. Which critical information is missing from the graph?

(a) y axis units
(b) x axis units
(c) relevant title
(d) optimum weight

10. A conclusion you could draw from the graph is that

(a) at some point, Farm 1 and Farm 2 cattle will be the same weight.
(b) Farm 2 is under-performing because it is over-stocked.
(c) Farm 1 is consistently out-performing the regional average.
(d) the information is of little value to the cattle producers.

11. The data in the graph could **best** be validated by

(a) including another farm's average.
(b) comparing other regional averages.
(c) only including farm averages above the regional average.
(d) including farm averages from several other farms.

12. When planning the long-term improvement of resources, producers should be aiming for

(a) equity.
(b) sustainability.
(c) competitiveness.
(d) risk mitigation.

13. Monogastrics break down food protein into which acid?

(a) acetic
(b) amino
(c) propionic
(d) butyric

See next page

14. What are the conflicting values of the triple bottom line in agriculture?

    (a) social, environmental and economic
    (b) revenue, people and planet
    (c) sustainability, social and environmental
    (d) moral, environmental values and financial

15. A ration that is the **most** cost-efficient way of supplying the required nutrients is called a

    (a) complete ration.
    (b) finishing ration.
    (c) least-cost ration.
    (d) standardised ration.

16. The measurement that describes variability across multiple samples of a population and includes sample size in its calculation is standard

    (a) error.
    (b) deviation.
    (c) mean.
    (d) median.

17. The **best** method to maximise favourable paternal traits in a flock/herd is

    (a) natural mating.
    (b) artificial insemination.
    (c) embryo transfer.
    (d) in vitro fertilisation.

18. Which of the following **best** describes the role that feed additives play in a livestock ration?

    (a) enhancing the colour and appearance of the livestock
    (b) providing essential nutrients, including carbohydrates, fats and protein
    (c) improving the digestibility of feed and enhancing nutrient absorption
    (d) supporting livestock foraging and/or grazing behaviours

19. Which of the following statements is the **most** accurate?

    (a) Natural ecosystems are more likely to have a lower level of biodiversity compared to agricultural and urban ecosystems.
    (b) Agricultural ecosystems rely more on human intervention for maintaining ecosystem balance compared to natural and urban ecosystems.
    (c) Agricultural ecosystems are more likely to have higher levels of pollution compared to natural and urban ecosystems.
    (d) Natural ecosystems are more likely to be self-sustaining with minimal human disturbance compared to agricultural and urban ecosystems.

See next page

20. The **most** important reason to retain biodiversity in agricultural systems is because

(a) genetic variability is low.
(b) new varieties can be used in the future.
(c) ecosystems can respond to change.
(d) each ecosystem is unique.

End of Section One

See next page

Section Two: Short answer **50% (103 Marks)**

This section has **six** questions. Answer **all** questions. Write your answers in the spaces provided.

Supplementary pages for planning/continuing your answers to questions are 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 **(17 marks)**

The economic principles of pest and disease control in agriculture involve optimising the balance between the costs of control measures and the potential economic losses caused by pests and diseases.

(a) Compare the concepts of economic threshold (ET) and economic injury level (EIL) in pest management. (5 marks)

You have been asked to design an investigation comparing how a livestock pest population changes over time after applying two different pest control methods.

(b) (i) Identify **two** different pest control methods you could choose to compare. (2 marks)

One: _____

Two: _____

(ii) State a hypothesis you could test for your investigation. (2 marks)

(iii) Comment on each of the following aspects of experimental design when planning your investigation. (8 marks)

Controlled variables:

Randomisation:

Replication:

Experimental error:

Question 22 **(15 marks)**

The relationship between the modes of action of pesticides, their effectiveness and the risk of resistance is an important component of livestock management.

(a) Using an example, explain the relationship between modes of action of pesticides and their effectiveness in treating animals. (5 marks)

(b) Describe **two** ways in which pesticide resistance can be avoided or managed. Do not include changing mode of action in your answer. (6 marks)

One:

Two:

See next page

(c) Outline **two** farm records that are required to meet quality assurance criteria in relation to livestock pest management. (4 marks)

One: _____

_____

_____

_____

Two: _____

_____

_____

_____

Question 23 **(16 marks)**

(a) Define the term 'estimated breeding value' (EBV). (2 marks)

(b) State why an EBV is only an estimation for performance. (1 mark)

(c) Describe why raw values are adjusted to create an EBV. (3 marks)

(d) A cattle breeding program is considering the implementation of a selection strategy based on EBVs, with the objective of improving their growth rates. They are deciding between the two bulls listed below:

	Birth weight (kg)	**200 day weight (kg)**	**400 day weight (kg)**	**600 day weight (kg)**
Breed average	40	256	367	505
Bull 1	-3.4	+12	+23	+18
Bull 2	+2	+14	+22	+23

(i) Calculate the expected average weight, in kg, of the calves of Bull 1 and Bull 2 at 600 days, assuming the maternal herd is equal to the breed average. (2 marks)

See next page

(ii) Explain which bull you would recommend using. (3 marks)

(iii) Outline a reason why the bull you did not select in part (d)(ii) above may be more profitable. (2 marks)

(e) Describe the role of pedigrees in a breeding program. (3 marks)

Question 24 **(20 marks)**

An understanding of the digestive system is important when formulating livestock rations.

(a) Complete the following table. (6 marks)

Nutrient	Common source	Site of digestion in a ruminant	Site of digestion in a monogastric
Carbohydrates	Oats		
Protein			Stomach
Fat		Small intestine	

(b) Contrast the metabolism of protein in a ruminant and a non-ruminant animal. (4 marks)

See next page

(c) (i) Select **two** ingredients from the list below to make a 15% protein ration for a prime lamb feedlot. (2 marks)

Ingredient	Protein %
Lupins	25
Wheat	15
Meat meal	45
Hay	10

One: _____

Two: _____

(ii) Calculate a prime lamb ration with the ingredients selected in part (c)(i) above. Using a Pearson square, show the percentage of each ingredient in the ration. Show your workings. (5 marks)

(iii) Select **one** ingredient that should not be used in the ration in part (c)(ii) above and outline the reason. (3 marks)

_____

_____

_____

_____

_____

_____

See next page

Question 25 **(18 marks)**

Improper use of pesticides can affect producers and consumers of livestock. Pesticide residue is monitored by various random and targeted testing programs in abattoirs to protect Australia's livestock industry.

(a) Describe **two** reasons for the development of pesticide resistance. (6 marks)

One: _____

Two: _____

(b) Outline **one** duty of care requirement for producers and their employees when using pesticides on livestock. (2 marks)

Random monitoring program results for 2020–21		
Commodity	**Samples**	**Compliance rates (%)**
Camel	15	100
Cattle	5649	99.96
Buffalo	10	100
Chicken	301	100
Deer	21	100
Donkey	2	100
Emu	9	100
Goat	300	99.33
Kangaroo	50	100
Ostrich	3	100
Pigs	1055	99.24
Sheep	2905	99.86
Wild-caught seafood	25	100

Table 1: Pesticide contamination of meat products.

Use the above table to answer the following questions.

(c) (i) Compare the level of compliance of the various animals that were tested. (2 marks)

(ii) Outline **one** reason for the differences in compliance rates. (2 marks)

See next page

Question 25 (continued)

(iii) Outline the possible effect of these monitoring results on Australia's animal export markets. (2 marks)

(d) Explain how a livestock producer could alter their animal production system in response to a consumer trend driven by pesticide use. (4 marks)

See next page

Question 26 **(17 marks)**

It is important to implement both short-term and long-term strategies to increase on-farm sustainability.

(a) Complete the table below, stating **one** short-term and **one** long-term strategy for each goal relevant to an animal production enterprise. (8 marks)

Goal	Short-term strategy	Long-term strategy
Increase on-farm water efficiency		
Improve soil health		
Utilise renewable energy		
Enhance animal welfare		

(b) Outline how implementing **one** new technology could increase both on-farm efficiency **and** sustainability. (4 marks)

See next page

Question 26 (continued)

(c) Outline a challenge which may occur when implementing a new technology to optimise an animal production system. (2 marks)

(d) Explain how a new technology could assist in monitoring the impact of climate change on an animal production system. (3 marks)

End of Section Two

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See next page

Section Three: Extended answer **30% (40 Marks)**

This section contains **three** questions. You must answer **two** questions: the compulsory question (Question 27) and **one** of the other questions (Question 28 or Question 29). For Question 27, write your answers on the lined pages following this question. For Question 28 or 29, write your answers on the lined pages following Question 29.

Supplementary pages for planning/continuing your answers to questions are 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 27 **(20 marks)**

Hormones are responsible for natural breeding behaviour and reproduction in livestock. Livestock reproduction is naturally controlled by hormones. Some of the most important hormones in the livestock breeding cycle include:

- gonadotropin-releasing hormone (GnRH)
- follicle-stimulating hormone (FSH)
- luteinizing hormone (LH)
- oestrogen
- testosterone.

Name a livestock production system you have studied.

Livestock production system: _____

(a) Using the livestock production system you have studied, outline how the hormones above play a critical role in a natural breeding program. (10 marks)

(b) Using the livestock production system you selected in part (a), outline **one** natural livestock breeding technique and **two** artificial breeding techniques, including an example of a relevant ethical issue. Compare how the desired outcomes of these three selected techniques can be used to progress toward breeding goals. (10 marks)

See next page

See next page

See next page

See next page

See next page

See next page

Question 28 **(20 marks)**

Australia exports approximately two-thirds of its agricultural produce, which may affect the sustainability of the industry and future generations.

(a) Discuss **two** national, state or on-farm protection strategies that an animal production system should consider to maintain Australia's global competitiveness. (10 marks)

(b) Define 'intergenerational equity'. Describe the long-term strategies that could be implemented by farmers to improve farm resources and promote intergenerational equity, using the triple bottom line. (10 marks)

or

Question 29 **(20 marks)**

Australian livestock production can be affected by events in the global economy.

(a) Explain the importance of the global economy to Australian animal production. Discuss the key characteristics of a major market (i.e. a country) for an Australian livestock product, including a major competitor in this market. (10 marks)

(b) Explain, using an example for each, **two** comparative advantages that Australian livestock producers have in the international market. (10 marks)

End of questions

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

ACKNOWLEDGEMENTS

Questions 9–11 Graph adapted from: NSW Education Standards Authority. (2017). *Growth Curves for Prime Lambs*. In 2017 Higher School Certificate Examination: Agriculture, p. 4. Retrieved April, 2024, from https://educationstandards.nsw.edu.au/wps/wcm/connect/bb6f5d0b-d903-4e32-8579-2d97ee4928d3/2017-hsc-agriculture.pdf?MOD=AJPERES&CACHEID=ROOTWORKSPACE-bb6f5d0b-d903-4e32-8579-2d97ee4928d3-nNdzsCv

Question 25 Data from: Department of Agriculture, Fisheries and Forestry. (2023). *Random Monitoring Program Results for 2022-23* [Table]. Retrieved April, 2024, from https://www.agriculture.gov.au/agriculture-land/farm-food-drought/food/nrs/animal-residue-monitoring

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