Government of **Western Australia**
School Curriculum and Standards Authority

ATAR course examination, 2019

Question/Answer booklet

ANIMAL PRODUCTION SYSTEMS

Please place your student identification label in this box

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: 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.

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Web version of 2019/53060

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	5	5	90	84	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 2019*. 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.

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. The economic injury level refers to the pest population

   (a) at which management action should be taken.
   (b) that will cause yield losses equal to the management costs.
   (c) that will cause yield losses greater than the management costs.
   (d) that will cause economic impact on product yield.

2. In Australia, tariffs help to protect agricultural production by

   (a) decreasing the production costs of imported goods.
   (b) increasing the production costs of imported goods.
   (c) making exported products cheaper for overseas customers.
   (d) making domestic products cheaper to buy than imported goods.

3. A gross margin is a suitable economic tool for comparing enterprises with similar

   (a) fixed costs.
   (b) variable costs.
   (c) market specifications.
   (d) export markets.

4. Pesticide resistance is **more** likely to develop as a result of the use of drenches that are

   (a) broad spectrum and short-acting.
   (b) broad spectrum and long-acting.
   (c) narrow spectrum and short-acting.
   (d) narrow spectrum and long-acting.

5. The main purpose of a National Vendor Declaration is to assist in the management of

   (a) the chemical contamination of product.
   (b) environmental contamination.
   (c) the introduction of exotic pests.
   (d) the development of pesticide resistance.

See next page

6. Select the three types of ecosystems in order of increasing nutrient cycling.

(a) natural, urban, agricultural
(b) urban, natural, agricultural
(c) urban, agricultural, natural
(d) agricultural, urban, natural

7. Duty of care in the workplace is a legal obligation concerned mainly with

(a) the protection of export markets.
(b) on-farm safety.
(c) animal welfare.
(d) farm biosecurity.

8. Pedigree information can be useful to livestock breeders because it

(a) proves that an animal is purebred.
(b) is used to determine Estimated Breeding Values.
(c) illustrates patterns of inheritance for selected traits.
(d) tracks the performance of individual animals.

9. The main export market for Australian red meat is

(a) Africa.
(b) the United States of America.
(c) the European Union.
(d) Asia.

10. The table below shows the productivity of the dairy and wool industries in two different countries (figures are in millions of tonnes). Assume that resources of equal value are required in each enterprise.

	Dairy	**Wool**
Country A	20	40
Country B	6	22

A mutually-beneficial trade agreement would involve Country A exporting dairy products to and importing wool from Country B.

Which statement **best** explains this trade agreement?

(a) Country A can produce dairy more cheaply than Country B.
(b) Country A has an absolute advantage in producing both dairy and wool.
(c) Country A has the greatest opportunity cost in producing wool.
(d) Country B can produce wool more cheaply than Country A.

11. Ensuring that activities of the current generation do not compromise the wellbeing of future generations is a concept known as

(a) intergenerational equity.
(b) the triple bottom line.
(c) social sustainability.
(d) heritable equity.

See next page

12. Which of the following is a common feed additive used solely to enhance protein synthesis in ruminant livestock?

(a) antibiotics
(b) hormones
(c) legumes
(d) urea

13. Selling off less valuable animals due to drought conditions is an example of risk

(a) assessment.
(b) avoidance.
(c) mitigation.
(d) probability.

14. A notifiable animal disease is one that

(a) is exotic to the country or state.
(b) poses a risk to human health.
(c) must be controlled through eradication.
(d) there is a legal obligation to report.

15. Clearing native bushland to establish agricultural systems can lead to a reduction in

(a) biodiversity.
(b) productivity.
(c) energy sources.
(d) pest species.

16. Which of the following materials can be fed legally to ruminant livestock?

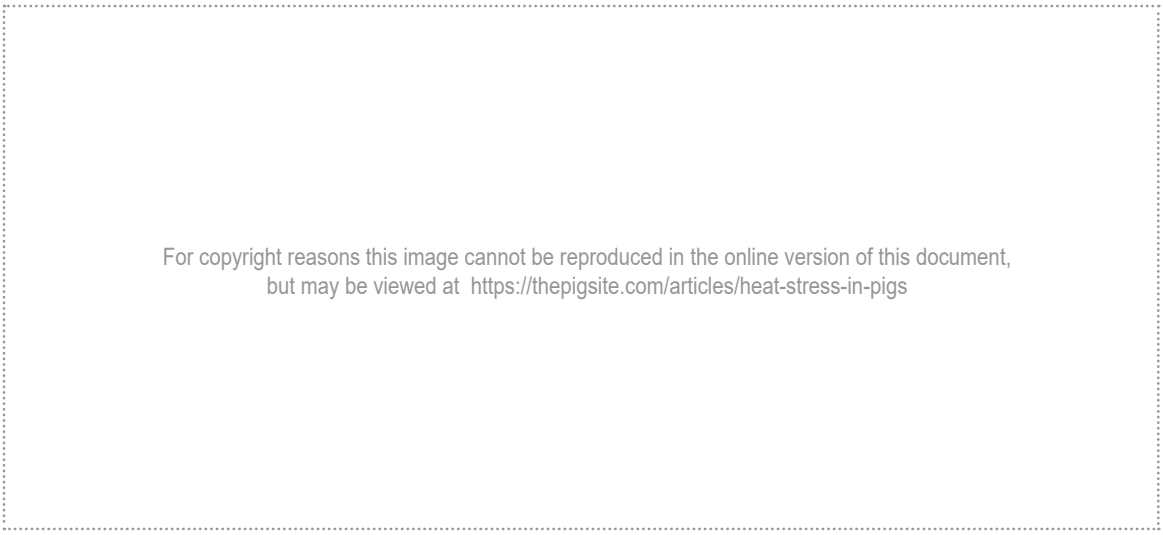
(a) blood meal
(b) molasses
(c) poultry meal
(d) offal

17. Which of the following livestock traits would be **most** influenced by environmental factors?

(a) multiple births
(b) body length
(c) fat content of milk
(d) age at first breeding

See next page

18. The graph below shows the effect of ambient temperature on the Average Daily Gain (ADG) in weight for pigs of different sizes (25, 50 and 75 kg body weights).



The effect of increasing temperature on pig productivity can be attributed largely to

(a) increased sweating.
(b) decreased physical activity.
(c) increased intake of water.
(d) reduced feed intake.

19. Which statement about the mode of action of contact pesticides is correct?

(a) They require direct exposure to the pest to be effective.
(b) They are absorbed into the host's body tissues.
(c) They target internal and external parasites.
(d) They pose no risk of pesticide resistance.

20. Animal production systems that can adapt quickly to changing consumer trends typically involve livestock that

(a) can be raised in extensive systems.
(b) have a long life span.
(c) have a short reproduction cycle.
(d) have fast growth rates.

End of Section One

See next page

Section Two: Short answer **50% (84 Marks)**

This section has **five** 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 **(18 marks)**

Egg size is a very important factor in a poultry enterprise as it has a major impact on a producer's profitability.

A study was carried out to investigate egg size in two different production systems.

Eggs were collected daily over a period of 50 weeks from 180 Hy-line Brown hens evenly distributed between the following systems:

- indoors in conventional cages (CC)
- free-range (FR) with access to shelter.

Mean egg weights for each group are shown in the table below:

Production system	Average (n=90)	Age of hens (weeks)					
		25	**35**	**45**	**55**	**65**	**75**
Conventional cage (CC)	Egg weight (g)	60.4	62.9	65.0	66.5	67.0	68.6
	Standard error	0.83	0.75	0.80	0.78	0.82	0.82
Free-range (FR)	Egg weight (g)	51.2	59.0	61.5	61.7	62.4	63.0
	Standard error	0.52	0.89	0.58	0.94	0.85	1.0

(a) Comment on how well this investigation meets **two** different requirements of good experimental design. (4 marks)

One: _____

_____

_____

_____

Two: _____

_____

_____

_____

(b) Draw a line graph on the grid below to show how egg weight changes with hen age for each production system. (5 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

Question 21 (continued)

(c) What are **two** possible conclusions that can be drawn from the data obtained in this study? (2 marks)

One: _____

_____

Two: _____

_____

(d) Comment on the significance of the standard errors for this data and suggest **one** way in which standard errors could be improved. (3 marks)

_____

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_____

(e) To meet consumer preferences, a caged egg producer is considering diversifying into a free-range system. Explain the key economic factors that should be considered when diversifying into a new production system. (4 marks)

_____

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See next page

Question 22 **(15 marks)**

Understanding the role of the endocrine system in reproduction is vital to the success of animal breeding enterprises. Hormones can affect both natural breeding behaviour and the physical processes of reproduction.

Four important hormones involved in livestock reproduction are:

- oestrogen
- progesterone
- oxytocin
- testosterone.

(a) (i) Select **two** of the hormones listed in the dot points above and complete the table below. Identify the site of production of each hormone and the role each plays in natural breeding behaviour and reproductive processes. (6 marks)

Hormone	Site of production	Role of hormone in:	
		Natural breeding behaviour	Reproductive processes
1.			
2.			

(ii) Explain how **one** of the four hormones listed in the dot points above can be used to manipulate breeding cycles in livestock. (4 marks)

See next page

Question 22 (continued)

(b) Name a breeding technology and explain how the management of an animal's endocrine system is critical to its success. (5 marks)

Breeding technology: _____

Explanation: _____

_____

_____

_____

_____

_____

_____

_____

Question 23 **(16 marks)**

The table below shows the financial records over a two-year period for a dairy farm running 225 cows on 100 hectares of improved pasture. The rainfall recorded in 2012 was significantly lower than in 2011.

	2011	2012
Gross income:		
Total milk sales	$712 000	
Livestock sales	$ 56 000	
Total income	**$768 000**	**$612 000**
Variable costs:		
Feed supplements – grains and hay	$221 540	
Pasture maintenance, fertilisers and irrigation	$ 74 860	
Animal health	$ 18 000	
Breeding and herd testing	$ 10 500	
Dairy shed expenses	$ 12 500	
Electricity and fuel	$ 29 320	
Freight	$ 5 000	
Casual labour	$ 85 000	
Total variable costs	**$456 720**	**$530 200**
Gross margin	**A**	
Gross margin/cow	**B**	

(a) Calculate the gross margins for 2011. Write your answers in boxes **A** and **B**. (2 marks)

Question 23 (continued)

(b) Explain using examples, the impact of drought on the following components of an enterprise's gross margin:

- total income
- variable costs. (8 marks)

Total income

Variable costs

See next page

It is predicted that climate change will increase the frequency and severity of droughts in Western Australia.

(c) Describe **two** strategies that could be adopted by a producer to mitigate the effects of future drought on economic sustainability. (6 marks)

One: _____

Two: _____

See next page

Question 24 **(22 marks)**

A good understanding of how digestive systems work enables livestock producers to provide appropriate nutrition for their animals.

(a) Compare the process of carbohydrate digestion in the microbial and gastric digestive systems. (4 marks)

(b) Explain **two** differences between livestock feed rations for animals with gastric digestive systems compared to those with microbial digestive systems. (8 marks)

One:

Two:

See next page

(c) The table below shows the digestible energy requirements for pigs at different stages of production.

Stage	Bodyweight (kg)	Digestible energy (MJ/kg consumed)
Early weaner	4–8	15.5
Weaner 1	8–16	15.0
Weaner 2	16–30	14.5
Grower 1	30–54	14.0
Grower 2	54–80	14.0
Finisher	80–95	13.2

(i) Why is the digestible energy requirement of a weaner piglet ration greater than that for grower piglets? Justify your answer. (3 marks)

(ii) Use a Pearson square to determine an appropriate feed ration for Finisher pigs. The available feeds are wheat (14.5 MJ/kg DM) and barley (11 MJ/kg DM). Show your working and express the ration as the percentage of each grain. (3 marks)

See next page

Question 24 (continued)

(d) Explain why sheep can be fed a lower protein diet than pigs while maintaining health and productivity. (4 marks)

Question 25 **(13 marks)**

Estimated breeding values (EBVs) are an important tool used by producers to assist in selecting breeding animals. The accuracy of EBVs is expressed as a percentage.

(a) Explain the importance of EBV accuracy when selecting an animal to meet breeding goals successfully. (4 marks)

See next page

(b) Outline how the following factors affect an animal's EBV:
- trait heritability
- sample size tested
- progeny testing. (6 marks)

Trait heritability

Sample size tested

Progeny testing

(c) Demonstrate, with an example, how an understanding of EBVs assists producers with their artificial insemination (AI) programs. (3 marks)

End of Section Two

See next page

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

This section contains **three** questions. You must answer **two** questions: the compulsory question (Question 26) and **one** of the other questions (Question 27 or Question 28). For Question 26, write your answer in the spaces provided. For Question 27 or Question 28, write your answers on the lined pages following Question 28.

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 26 **(20 marks)**

This compulsory question must refer to **one** animal production system you have studied during the year.

Animal production system: _____ (0 marks allocated)

(a) Using examples, discuss how on-farm practices meet the requirements of a stated quality assurance program. (6 marks)

Quality assurance program: _____

(b) Describe **two** factors that can cause variations in a marketable animal product. Explain the strategies that can be applied to minimise these product variations. (8 marks)

(c) Describe how a new technology could improve the efficiency of an animal production system. Outline **one** factor that would need to be considered when introducing this technology. (6 marks)

See next page

Question 27 **(20 marks)**

The use of pesticides is an important tool for controlling parasite populations. However, pesticides must be used responsibly to avoid adverse consequences.

(a) Explain the economic, social and environmental issues related to the use of pesticides to control parasites in livestock effectively. (12 marks)

(b) Outline how pesticide resistance develops. Describe **two** on-farm strategies that could be implemented to reduce this threat. (8 marks)

or

Question 28 **(20 marks)**

Feed additives and growth promotants can be used in animal production systems to maximise production efficiency and profitability.

(a) Using examples, compare the function of feed additives and growth promotants in livestock. Explain how these improve enterprise efficiency and profitability. (11 marks)

(b) Discuss the potential marketing issues associated with using growth promotants in planning sustainable production systems. Describe the legal requirements relating to the use of these growth promotants. (9 marks)

End of questions

Question number: _____

Question number: _____

Question number: _____

Question number: _____

Question number: _____

Question number: _____

Question number: _____

Supplementary page

Question number: _____

Spare grid

ACKNOWLEDGEMENTS

Question 18 Linden, J. (2014). Effect of ambient temperature on the average daily gain of grower-finisher pigs [Graph]. *The Pig Site.* Retrieved June, 2019, from https://thepigsite.com/articles/heat-stress-in-pigs

Question 24(c) Table adapted from: Queensland Government, Department of Agriculture and Fisheries. (2013). *The ideal amino acid pattern of dietary protein for growers and breeders* [Table]. Retrieved April, 2019, from https://www.daf.qld.gov.au/business-priorities/agriculture/animals/pigs/feed-nutrition/nutrients-diets/nutrient-needs

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