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

ATAR course examination, 2022

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	100	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 2022: 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 shows the ecosystems in order from the greatest to the least amount of recycling of matter?

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

2. In microbial digestive systems, volatile fatty acids (VFAs) are mainly produced in the animal's

   (a) mouth.
   (b) abomasum.
   (c) rumen.
   (d) caecum.

3. A valid reason for introducing a tariff is to

   (a) stimulate trade through aiding in the establishment of free trade agreements.
   (b) increase the comparative advantage between trading partners.
   (c) assist domestic producers by increasing the price of imported goods.
   (d) protect exporters against price fluctuations in the global marketplace.

4. An effective strategy for preserving the biodiversity within an animal production system is to

   (a) fence off natural habitats.
   (b) use only residual pesticides.
   (c) diversify animal enterprise mixes.
   (d) fence along contours and soil types.

5. A producer has selected a bull with an estimated breeding value (EBV) for birthweight of –6 kg. The average expected birthweight for calves of this breed is 50 kg. What is the expected average birthweight of this bull's progeny?

   (a) 44 kg
   (b) 47 kg
   (c) 53 kg
   (d) 56 kg

See next page

Questions 6 and 7 refer to the data presented below.

The table below shows a summary of data from a lamb production investigation.

	Birthweight (kg)	Weaning weight (kg)	120 day weight (kg)
Mean	3.76	18.74	26.20
Minimum	1.51	7.84	6.03
Maximum	6.90	39.87	44.80

6. At which point in the production cycle does the data show the **greatest** standard deviation?

(a) birthweight
(b) weaning weight
(c) 120 day weight
(d) all are identical

7. Which of the following would indicate the accuracy of each mean compared to the true population?

(a) standard deviation
(b) standard error
(c) median
(d) range

8. In livestock with a gastric digestive system, a by-product of carbohydrate metabolism is

(a) simple sugar.
(b) volatile fatty acid.
(c) carbon dioxide.
(d) glucose.

9. The table below shows the productivity of two different animal production systems in two countries. Assume that resources of equal value are required by each production system.

In the trade between the countries of these two commodities, which statement is correct?

	Country A	Country B
Goats	30 units	30 units
Pigs	6 units	21 units

Country

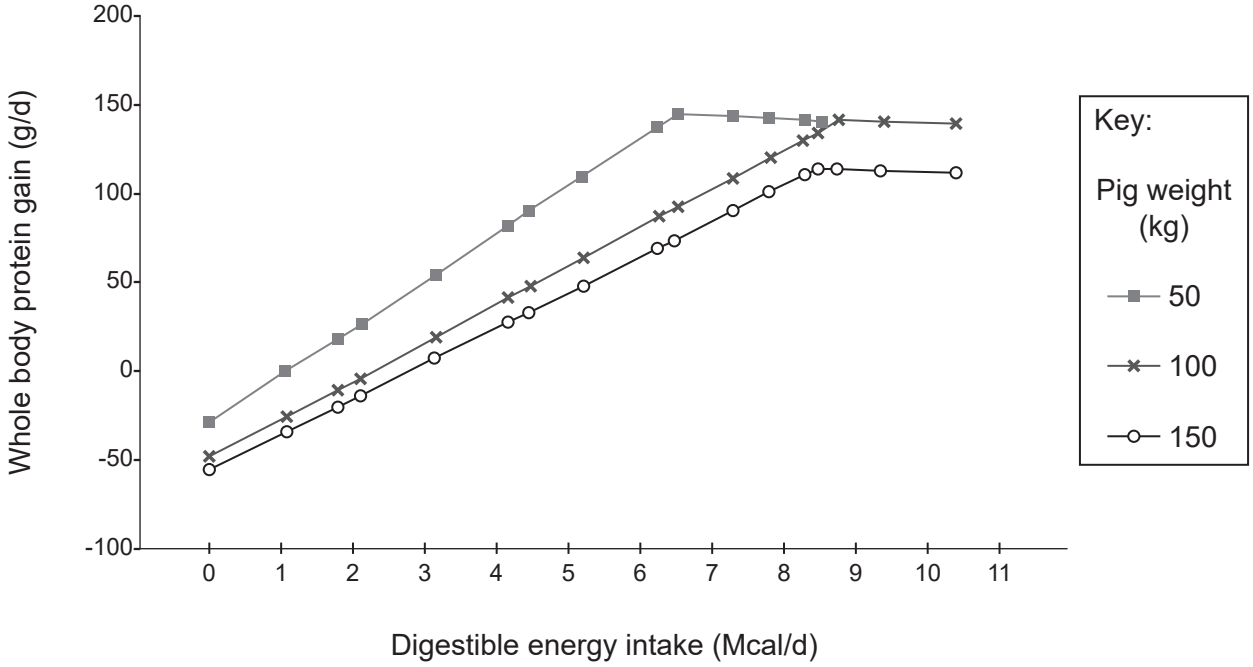
(a) A has a comparative advantage in pigs.
(b) B has a comparative advantage in pigs.
(c) A has a comparative advantage in goats.
(d) B has a comparative advantage in goats.

See next page

10. What type of additive can be used to reduce the effect of acidic conditions caused by feeding high grain rations to ruminants?

(a) coccidiostats
(b) antioxidants
(c) antibiotics
(d) buffers

11. The graph below shows the relationship of whole body protein gain, i.e. muscle growth and digestible energy intake in pigs with a body weight between 5 and 150 kg, when fed diets containing adequate protein.



Which of the following conclusions is **best** supported by the data illustrated in this graph?

(a) Larger pigs need less energy.
(b) Smaller pigs need less protein.
(c) Protein is an important energy source.
(d) Energy is required for protein metabolism.

See next page

12. Duty of care in the workplace is concerned primarily with

    (a) animal welfare laws.
    (b) occupational safety and health.
    (c) environmental protection.
    (d) quality assurance.

13. The point at which the amount of pest damage justifies the cost of control is known as the

    (a) pest resistance level.
    (b) economic threshold.
    (c) resistance threshold.
    (d) economic injury level.

14. Which of the following programs enables the lifetime traceability of individual livestock animals?

    (a) National Livestock Identification System
    (b) National Vendor Declaration
    (c) Livestock Production Assurance
    (d) Meat Standards Australia

15. Which of the following is used when calculating a gross margin?

    (a) land purchase
    (b) fence replacement
    (c) building insurance
    (d) sales commission

16. Which of the following is the **least** effective option for achieving long-term sustainability?

    (a) improving water storage
    (b) implementing precision farming technology
    (c) maximising stocking rate
    (d) incorporating shelter belts

17. A trait which must be inherited from both parents is referred to as being

    (a) heterozygous.
    (b) recessive.
    (c) homozygous.
    (d) dominant.

18. Reducing the severity of a risk is known as

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

See next page

19. Which breeding technology inserts a manipulated gene from one organism into the genetic material of another?

(a) cloning
(b) artificial insemination
(c) embryo transfer
(d) genetic modification

20. Which part of a microbial digestive system performs the same function as the stomach in a gastric digestive system?

(a) abomasum
(b) reticulum
(c) omasum
(d) rumen

End of Section One

See next page

Section Two: Short answer **50% (100 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 **(19 marks)**

The endocrine system plays a vital role in the reproduction of livestock.

(a) (i) Describe how the endocrine system influences body systems. (3 marks)

(ii) Identify a hormone released from the pituitary gland that affects the functioning of the reproductive system and outline how it does so. (3 marks)

See next page

(b) For each sex, identify a hormone released by the gonads that controls natural breeding behaviour. Describe the effect of each hormone on natural breeding behaviour and successful conception. (8 marks)

Male:

Female:

(c) State **one** method of artificially manipulating the female reproductive cycle and explain its use in commercial animal production systems. (5 marks)

Method:

Explanation:

Question 22 **(17 marks)**

Sound nutritional management is essential to the success of all animal production systems.

To finish lambs for market, a producer wanted to formulate a ration containing 14% crude protein. The following feeds and additives were available.

	Crude protein %
Barley	10
Cereal straw	3
Meat meal	45
Urea	Equivalent to 280

(a) (i) Summarise the suitability of each of the following feeds and additives when formulating a finishing ration for ruminants in a feedlot. (8 marks)

Barley: _____

_____

_____

_____

Cereal straw: _____

_____

_____

_____

Meat meal: _____

_____

_____

_____

Urea: _____

_____

_____

_____

See next page

(ii) Select the **two** most suitable ingredients from part (a)(i) for this ration. (2 marks)

One: _____

Two: _____

(iii) Using a Pearson square, calculate the amount of each ingredient required to produce 50 tonnes of rations. Show all workings in the space provided below. (4 marks)

See next page

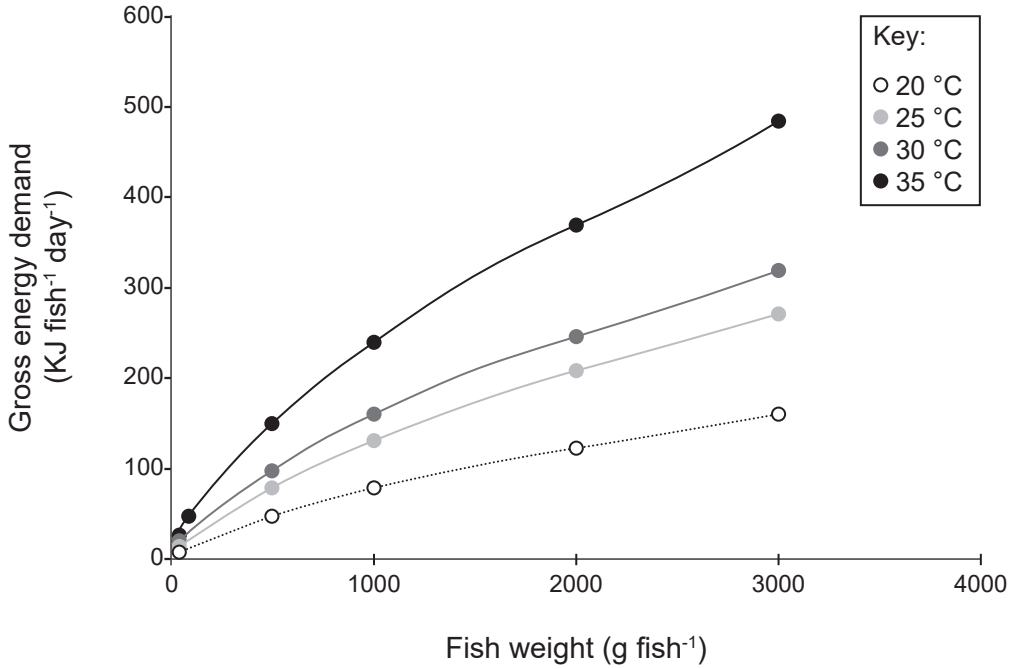
Question 22 (continued)

(b) Describe the relationship between a least-cost ration and the profitability of an animal production system. (3 marks)

See next page

Question 23 **(17 marks)**

The graph below shows data collected in an investigation into the nutritional requirements of farmed barramundi fish at different temperatures.



(a) Outline the main hypothesis that is being tested in this investigation. (2 marks)

(b) Describe how each of the following aspects of good experimental design could have been achieved in this investigation. (9 marks)

Controlled variables:

See next page

Question 23 (continued)

Randomisation:

Replication:

(c) Present a detailed conclusion from the data shown in the graph on page 13. (3 marks)

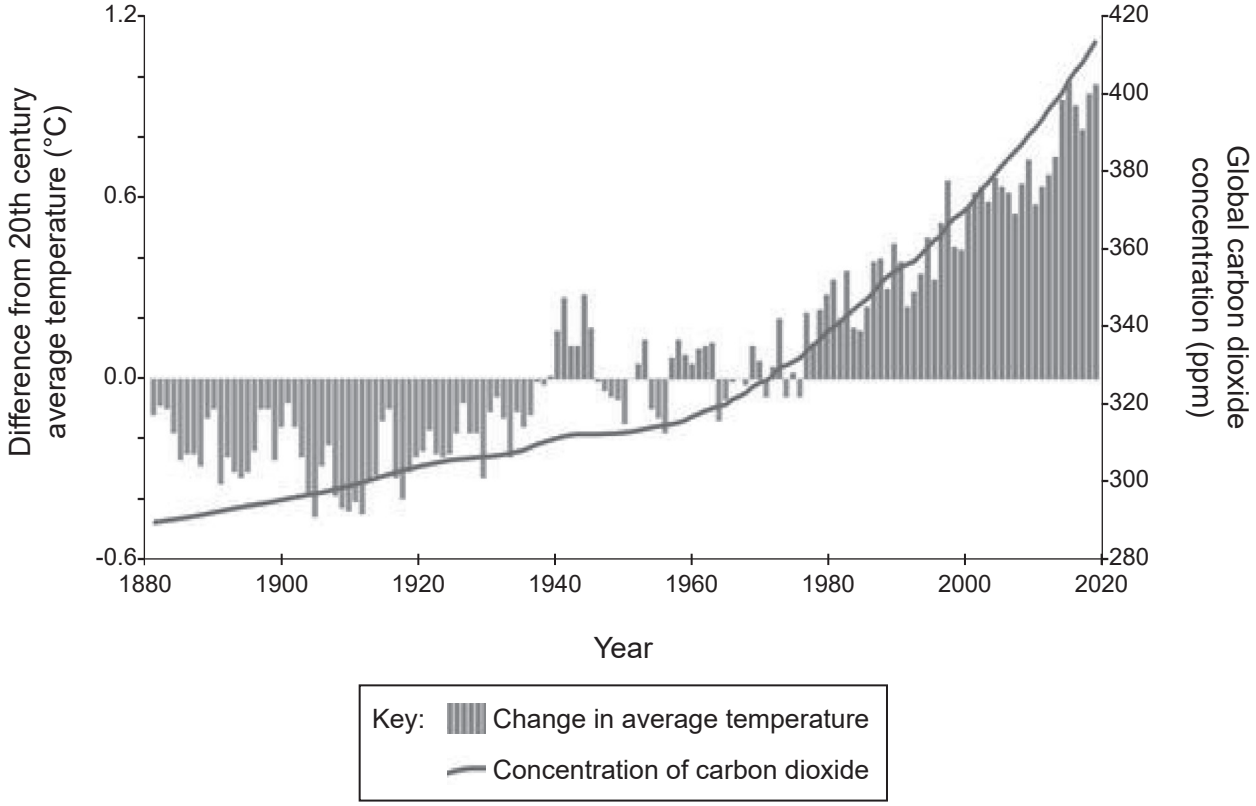
(d) Using the data provided, consider the economic impact of farming barramundi fish at a temperature of 35 °C. (3 marks)

See next page

Question 24 **(16 marks)**

Climate change is having a dramatic impact on the sustainability of animal production systems.

Global atmospheric carbon dioxide and surface temperature (1880–2020)



(a) Outline how the information in the graph above is linked to climate change. (2 marks)

See next page

Question 24 (continued)

(b) (i) Identify **one** predicted result of climate change and describe its impact on an animal production system. (4 marks)

(ii) Outline **three** strategies that could be used to help an animal production system respond to the climate change prediction identified in part (b)(i). (6 marks)

One:

Two:

Three:

(c) Identify a technology that could be used to manage climate change risk in livestock production. Describe the importance of this technology in optimising production. (4 marks)

Technology: _____

_____

Description: _____

_____

_____

_____

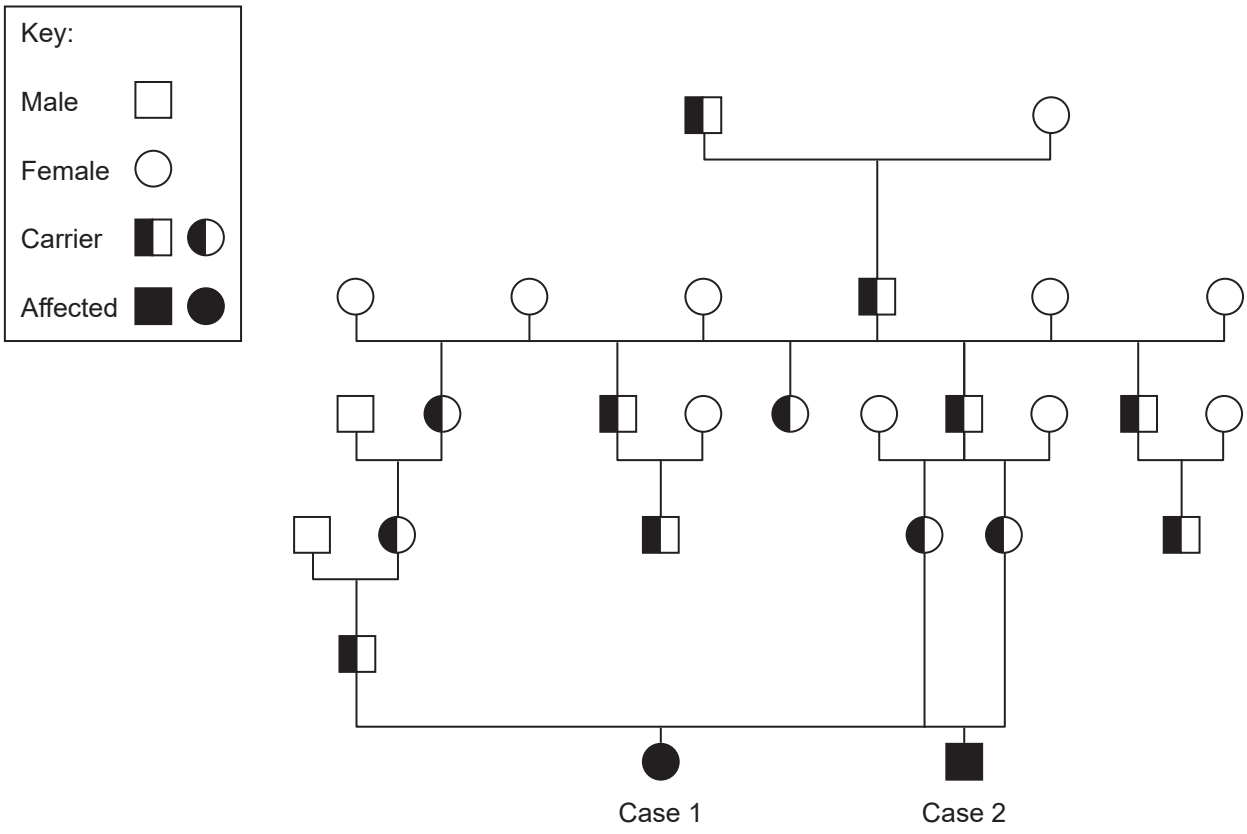
_____

_____

See next page

Question 25 **(13 marks)**

A producer is experiencing increased mortality rates within his breeding stock. The deaths are due to a congenital disease known as Chondrodysplasia (dwarfism). The incident of Chondrodysplasia in his herd is shown in the pedigree chart below.



(a) Use the pedigree chart above to explain the increase in mortality within the breeding stock. (4 marks)

(b) Describe how using pedigrees to map the heritability of traits can be a valuable tool for producers. (3 marks)

(c) (i) Describe **one** management strategy that the producer could use to control the incidence of Chondrodysplasia within this herd. (3 marks)

(ii) Describe **one** breeding technology that the producer could use to control the incidence of Chondrodysplasia within this herd. (3 marks)

Question 26 **(18 marks)**

A producer compares two feeding options to feed 120 wethers for export. One option is grain, the other is pellets. The average final weight of the wethers fed on grain was 52 kilograms. The average final weight of those fed on pellets was 68 kilograms.

(a) Use the information provided above to complete boxes A to F in the table below. (6 marks)

	Wether sale prices		
Live weight (kgs)	36.1–48	48.1–65	65.1 +
Price/head	$120	$160	$180

	Grain		**Pellets**	
Income		**Total**		**Total**
Sales	120 head	**A =**	120 head	**B =**
Expenses				
Feed	$45 per head	5400	$600/tonne	7488
Husbandry	$15 per head	1800	$15 per head	1800
Health	$10 per head	1200	$10 per head	1200
Gross margin		**C =**		**D =**
Gross margin/head		**E =**		**F =**

(b) On the basis of the financial information provided in the gross margin, justify the advice you would give to this producer in relation to feed choice. (5 marks)

See next page

(c) Consider the choice of ration if the price of pellets increased to $700/tonne. Show your workings. (3 marks)

(d) Events in the global economy can affect Australian agriculture. Explain how worldwide events may have an impact on future animal feed prices. (4 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 27) and **one** of the other questions (Question 28 or Question 29). For Question 27, write your answer in the spaces provided. For Question 28 or Question 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)**

This compulsory question must refer to one animal production enterprise and one marketed product you have studied during the year.

Animal production enterprise: _____

Marketed product: _____

(a) (i) Identify **three** measurable market requirements of your enterprise's marketed product. (3 marks)

One: _____

_____

Two: _____

_____

Three: _____

_____

(ii) Describe **one** factor that has a significant impact on product quality and explain a risk mitigation strategy used to manage this. (7 marks)

Factor: _____

Risk mitigation strategy: _____

See next page

Question 27 (continued)

(b) Evaluate, using examples, the extent to which your enterprise effectively (10 marks)

meets consumer trends:

incorporates new technologies:

See next page

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See next page

Question 28 **(20 marks)**

Australian agriculture is a net exporter, and so must maintain competitiveness with other countries in order to be sustainable.

(a) Explain how Australian producers contribute to this competitiveness by managing the 'triple bottom line'. Support your response by providing **one** relevant example for each factor. (12 marks)

(b) Assess why the demands of the 'triple bottom line' factors in animal production systems are often in conflict with each other. Support your response by providing **one** example of each factor. (8 marks)

or

Question 29 **(20 marks)**

The effectiveness of pesticides is a major factor in the productivity of animal production systems.

(a) Explain, using a relevant example, the relationship between pesticide mode of action and effectiveness in animal treatment. Describe factors (other than rotation based on mode of action) that can be used to avoid or manage resistance. (8 marks)

(b) Explain a management strategy that could be implemented to control pest outbreaks that occur:
- locally
- nationally, **and**
- internationally. (12 marks)

End of questions

Question number: _____

Question number: _____

Question number: _____

Question number: _____

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

Supplementary page

Question number: _____

ACKNOWLEDGEMENTS

Question 11 National Research Council. (1998). Relationship of … and … in pigs from 5 to 150 kg body weight (Fig. 3-4) [Graph]. *Nutrient requirements of swine* (10th ed.) (p. 34). National Academy of Science. Retrieved June, 2022, from http://www.agri.ubu.ac.th/mis/evaluate/assess_learn/upload/67016.pdf

Question 23 Glencross, B., & Bermudes, M. (2012). Adapting … to understand the implications of … (Lates calcarifer) …? (Fig. 6) [Graph]. *Aquaculture Nutrition*, *18*(4). Retrieved June, 2022, from https://www.researchgate.net/figure/Gross-energy-demand-kJfish-1day-1-for-barramundi-from-20-to-35C-and-up-to-fish-of_fig6_260294322

Question 24 Diamond, H. (2021). *Global atmospheric carbon dioxide and surface temperature (1880–2020)* [Graph]. Retrieved June, 2022, from https://www.climate.gov/news-features/climate-qa/if- ... -why-isn%E2%80%99t- …
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