External assessment 2021

Agricultural Science

Paper 1

Time allowed

- Perusal time — 10 minutes
- Working time — 90 minutes

General instructions

- Answer all questions in this question and response book.
- QCAA-approved calculator permitted.
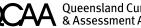- Planning paper will not be marked.

Section 1 (20 marks)

- 20 multiple choice questions

Section 2 (40 marks)

- 8 short response questions

Section 1

Instructions

- Choose the best answer for Questions 1–20.
- This section has 20 questions and is worth 20 marks.
- Use a 2B pencil to fill in the A, B, C or D answer bubble completely.
- If you change your mind or make a mistake, use an eraser to remove your response and fill in the new answer bubble completely.

	A	B	C	D
Example:	●	○	○	○

	A	B	C	D
1.	○	○	○	○
2.	○	○	○	○
3.	○	○	○	○
4.	○	○	○	○
5.	○	○	○	○
6.	○	○	○	○
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12.	○	○	○	○
13.	○	○	○	○
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17.	○	○	○	○
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19.	○	○	○	○
20.	○	○	○	○

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Section 2

Instructions

- Write using black or blue pen.
- If you need more space for a response, use the additional pages at the back of this book.
  - On the additional pages, write the question number you are responding to.
  - Cancel any incorrect response by ruling a single diagonal line through your work.
  - Write the page number of your alternative/additional response, i.e. See page …
  - If you do not do this, your original response will be marked.
- This section has eight questions and is worth 40 marks.

QUESTION 21 (1 mark)

Identify the six different types of energy involved in digestion and metabolism of food.

QUESTION 22 (4 marks)

A cage egg producer in Queensland is concerned about the low level of cage egg sales in the retail market. Explain two risk management strategies the producer could use to help prevent financial loss.

QUESTION 23 (4 marks)

a) Describe paddock rotation and the reason for this practice.   *[2 marks]*

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The table contains yield data for different grazing management strategies.

Strategy	Annual yield (t DM/ha)	Utilisation (%)
Continuous grazing	8.5	60
Paddock rotation	10.2	65
Cell grazing	10.2	80

b) Draw a conclusion about the grazing strategy most likely to increase animal production. Justify your conclusion.   *[2 marks]*
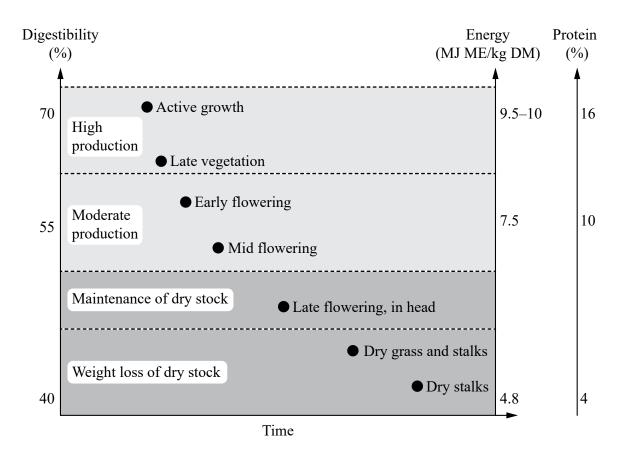
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QUESTION 24 (6 marks)

a) Identify one significant animal disease that affects production.   *[1 mark]*

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b) Identify two health effects and two economic effects of the disease identified in
    Question 24a).   *[2 marks]*

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c) Use an example to explain a biological method of pest control and the conditions that
    should be met before it is used to control an animal pest.   *[3 marks]*

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QUESTION 25 (5 marks)

The graph shows changes in pasture quality over time. The table contains the energy and protein requirements for weaner sheep at different live weights.

Live weight	Weaner < 20 kg	Weaner 20–25 kg	Weaner > 25 kg
Metabolisable energy (MJ/kg dry matter)	3.4–4.5	4.5–5.7	5.7–6.8
Crude protein (%)	14–16	12–14	10–12

a) Describe one function of protein in an animal's diet. *[1 mark]*

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b) Use the table to identify the relationship between the crude protein requirement and the weight of weaner sheep. *[1 mark]*

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c) Use the graph and table to draw a conclusion about the effect on animal growth if a group of 30 kg weaner sheep was fed a grass-based pasture at the late flowering and dry grass and stalks stages. Explain your reasoning. *[3 marks]*

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QUESTION 26 (7 marks)

A producer is developing a cropping plan for next summer. They are considering whether they should plant peanuts or lucerne.

Peanuts	Budget ($/ha)
Income	
Jumbo (2.5 t/ha @ $1200/t)	3000
Ones (0.5 t/ha @ $1000/t)	500
Splits (0.25 t/ha @ $900/t)	**X**
Total income	**Y**
Variable costs	
Fallow management	16
Planting	313
Plant nutrition	87
Plant protection	129
Irrigation	360
Harvesting	241
Total variable costs	1146

Lucerne	Budget ($/ha)
Income	
AFIA Grade A1 (320 bales/ha @ $8/bale)	2560
AFIA Grade B2 (106 bales/ha @ $6/bale)	636
AFIA Grade C3 (106 bales/ha @ $4/bale)	424
Total income	3620
Variable costs	
Fallow management	29
Planting	35
Plant nutrition	44
Plant protection	8
Irrigation	630
Harvesting	193
Other	32
Total variable costs	**Z**

a) Determine the values for the cells marked X, Y and Z in the tables. *[3 marks]*

X: _____

Y: _____

Z: _____

b) Use the data in the tables to identify which crop the producer should plant.
Provide reasoning for your decision. *[4 marks]*

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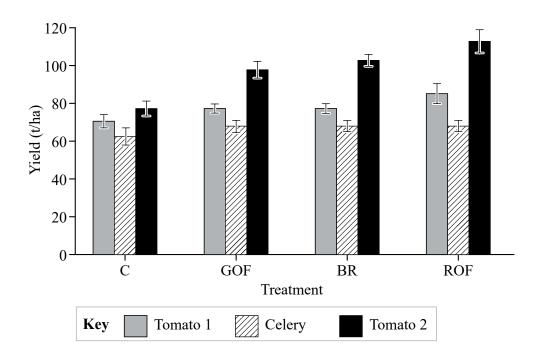_____

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QUESTION 27 (7 marks)

A trial was conducted on a double-crop rotation system, using nitrogen supplied in different forms, to evaluate the effects of different fertilisers on crop yield.

The different kinds of common organic fertilisers used and compared to the control treatment (C) were:

- general organic fertiliser (GOF)
- biogas residue (BR)
- refined organic fertiliser (ROF).

Both crops of tomato used the same variety.

The graph shows the mean yield for each crop and fertiliser treatment. Error bars represent 95% confidence intervals.

a) Explain why nitrogen is important for plant growth in agricultural crops. *[2 marks]*

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b) Analyse the data to identify the relationship between the type of fertiliser applied and celery yield. *[1 mark]*

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c) Decide which fertiliser tomato farmers should use to optimise production in this cropping system. Justify your decision with two pieces of evidence and give a reason this type of fertiliser would be expected to improve the yield of a tomato crop. *[4 marks]*

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QUESTION 28 (6 marks)

A dairy farm in the tick-free zone of Queensland has been quarantined due to a cattle tick infestation. The producer is required to treat their animals over a two-year period to eradicate the infestation and then continue to treat their animals to prevent re-infestation.

Discuss an effective strategy for a two-year period, considering the goals and implications of using chemicals in a dairy enterprise.

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ADDITIONAL PAGE FOR STUDENT RESPONSES

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References

Question 23

Data from Agriculture and Horticulture Development Board 2018, 'Table 5: A guide to expected utilisation according to different grazing systems' in *Planning Grazing Strategies for Better Returns* (Better Returns Manual 8), p. 10, https://ahdb.org.uk/knowledge-library/planning-grazing-strategies-for-better-returns.

Question 25

Diagram adapted from Meat & Livestock Australia 2019, Figure 2 in 'Improving pasture use with the MLA Pasture Ruler' factsheet available at: https://www.mla.com.au/globalassets/mla-corporate/extensions-training-and-tools/creative-commons/pasture-ruler-tips-and-tools---cc.pdf. Licensed under Creative Commons Licence CC-BY-SA 4.0.

Table — Data from Tool 11.1 in Energy and protein requirements of sheep 2022, http://www.makingmorefromsheep.com.au/healthy-contented-sheep/tool_11.1.html

Question 26

Data from NSW Department of Primary Industries 2013, 'Surface irrigated lucerne — established stand' in *Farm Enterprise Budget Series — Northern Zone*, summer 2012–2013, www.dpi.nsw.gov.au/__data/assets/pdf_file/0008/175922/Irrigated-surface-lucerne-12-13.pdf

Data from Queensland Government 2017, 'Peanut (Irrigated) North Burnett 2016' (report), *AgMargins*, Department of Agriculture and Fisheries, https://agmargins.net.au/Reports/Details/2ec442dd-adab-47e8-a4aa-033e472359ce. Licensed under CC BY 3.0.

Question 27

Adapted from Li, S et al. 2017, Figure 1 in 'Effect of different organic fertilizers application on growth and environmental risk of nitrate under a vegetable field', *Scientific Reports*, vol. 7, no. 1., page 2 available at: www.nature.com/articles/s41598-017-17219-y
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