LUI | | | | | | | | | | | School code | | | | |

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Book ☐ of ☐ books used

External assessment 2025

Question and response book

Agricultural Science

Paper 2

Time allowed

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

General instructions

- Answer all questions in this question and response book.
- Write using black or blue pen.
- QCAA-approved calculator permitted.
- Planning paper will not be marked.

Section 1 (36 marks)

- 9 short response questions

Section 2 (16 marks)

- 1 extended response question

Clear zone — margin trimmed off after completion of assessment

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

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Section 1

Instructions

- 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 nine questions and is worth 36 marks.

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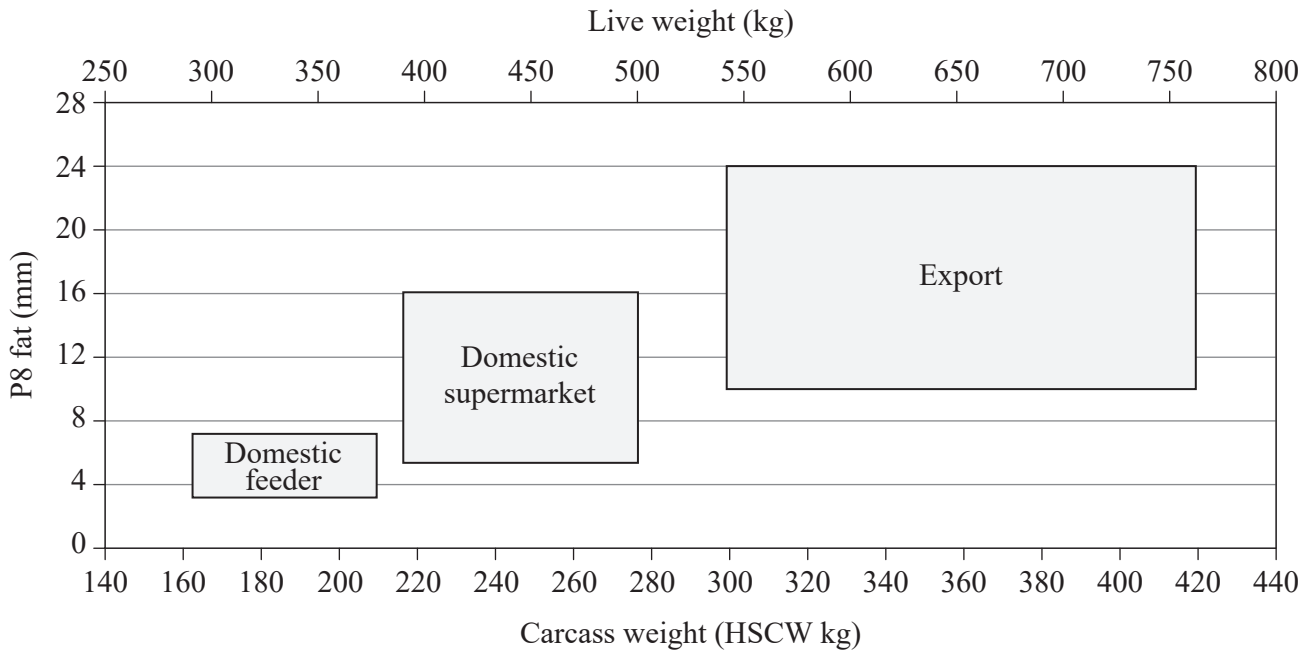
QUESTION 1 (6 marks)

a) Describe the role of an animal quality assurance program such as Meat Standards Australia. *[2 marks]*

The graph shows the market specifications for store (feeder) cattle at slaughter.



b) Identify the most suitable market for a steer at slaughter that is 405 kg live weight and has a P8 measurement of 12 mm. *[1 mark]*

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c) Discuss the market options for a steer that is 350 kg live weight, has a P8 measurement of 12 mm and a large frame score. In the discussion, identify a chosen target market and explain two strategies the farmer should employ to meet the market requirements. *[3 marks]*

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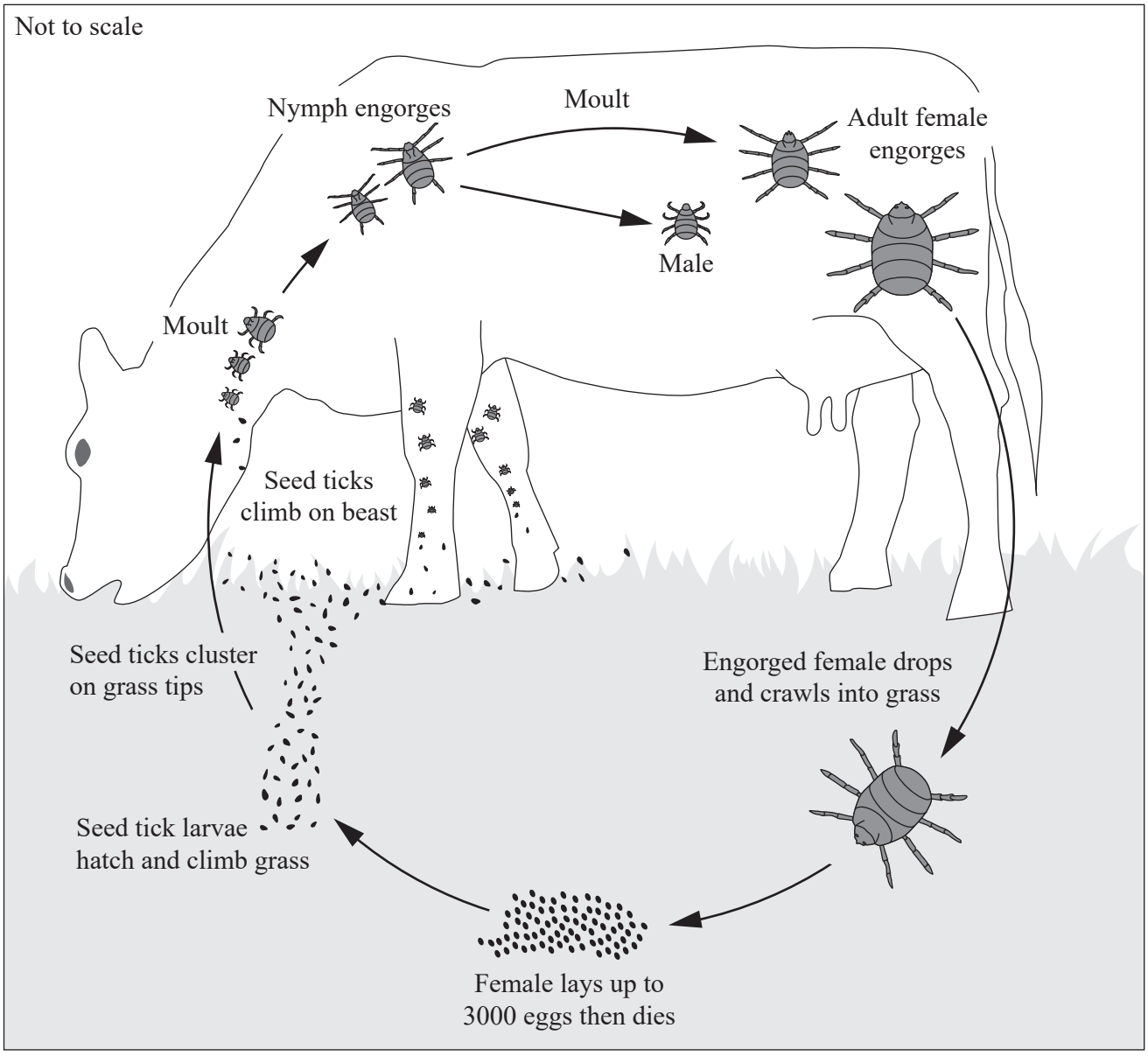
QUESTION 2 (5 marks)

The diagram shows the life cycle of cattle ticks.



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A producer uses integrated pest management (IPM) to control cattle ticks on their property.

a) Identify the optimal time to apply a tickicide to break the life cycle of cattle ticks. *[1 mark]*

b) Describe two benefits of using two different chemicals for the control of cattle ticks. *[2 marks]*

c) Describe two effective strategies, other than chemical control, that can be used as part of an IPM strategy for the control of cattle ticks. *[2 marks]*

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QUESTION 3 (2 marks)

Describe one advantage and one disadvantage of succession planning.

Advantage: _____

_____

_____

Disadvantage: _____

_____

_____

QUESTION 4 (3 marks)

Use an example to explain two impacts a government decision could have on a selected agricultural enterprise.

_____

_____

_____

_____

_____

_____

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QUESTION 5 (3 marks)

Use an example to identify two characteristics of a beneficial organism used in a plant production system.

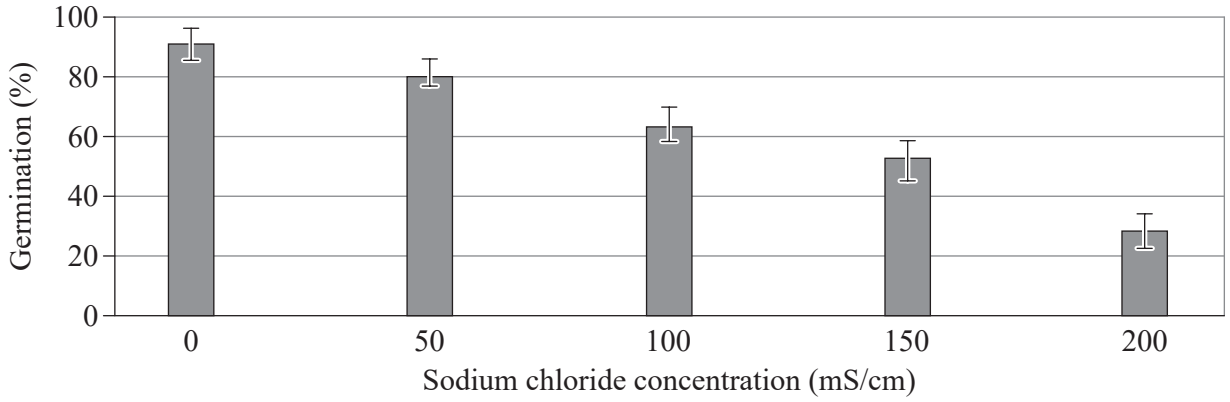
QUESTION 6 (4 marks)

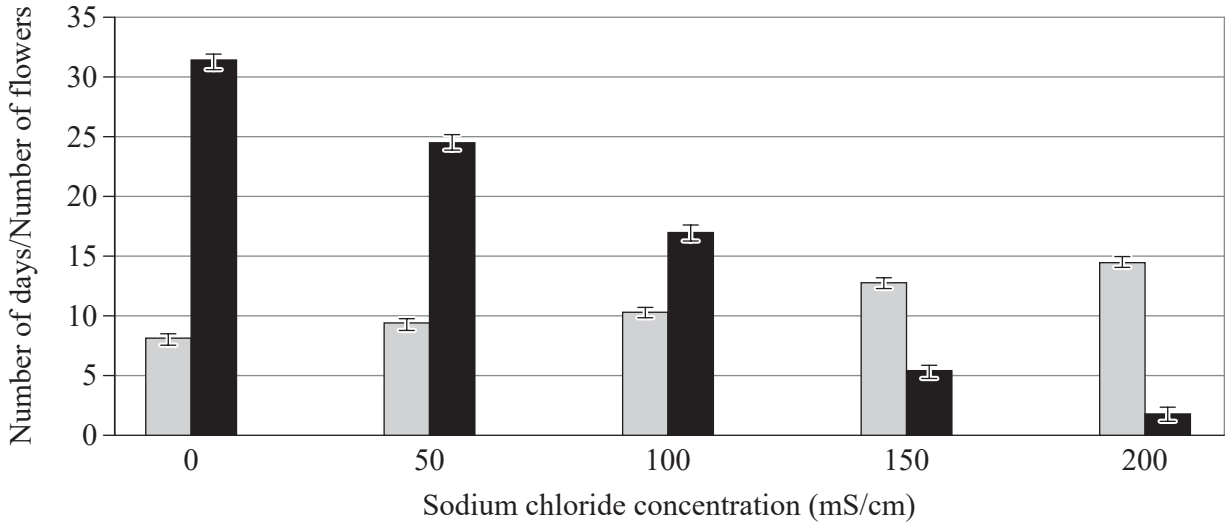
Use an example of a value-added product and its original raw plant product to describe two benefits of value-adding to the selected agricultural plant product.

Do not write outside this box.

QUESTION 7 (4 marks)

An experiment was conducted to test the effects of different levels of sodium chloride concentration in soil on a new cultivar of an agricultural crop. The graphs show the mean values for the effect of different levels of sodium chloride concentration on germination, time of germination and number of flowers per plant. Standard error bars are included for each mean value.





Key Time of germination (days) Number of flowers per plant

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Draw two conclusions about the tolerance of the agricultural crop to soil salinity. Use evidence from both graphs to support your conclusion.

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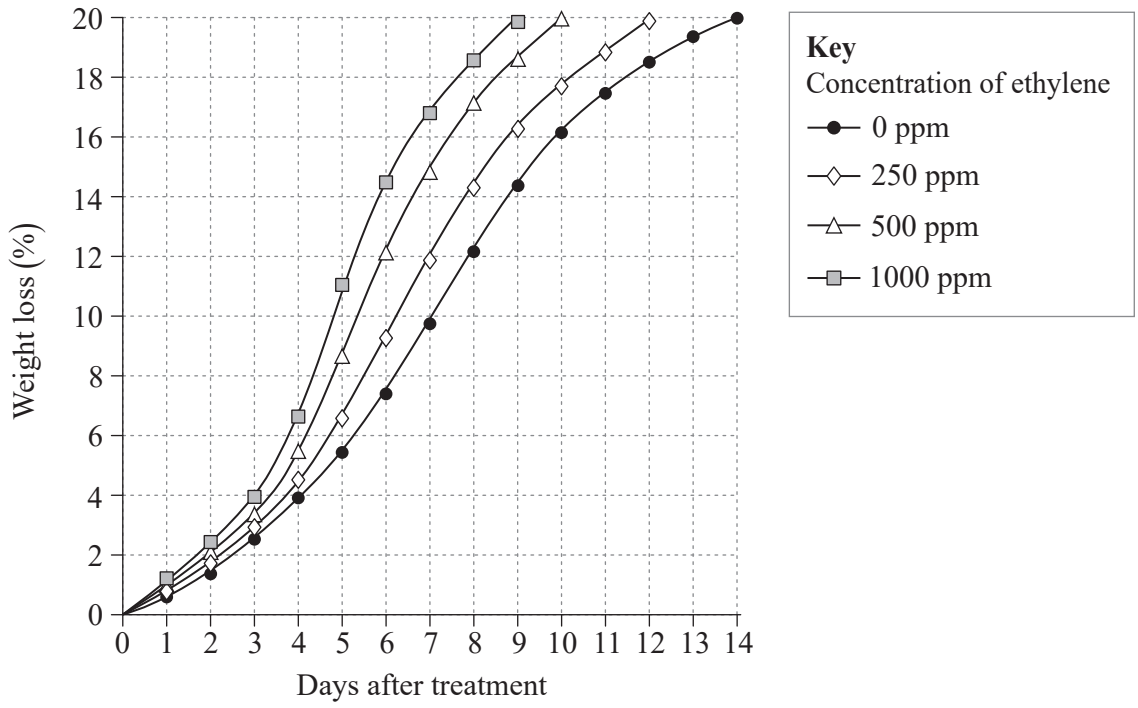
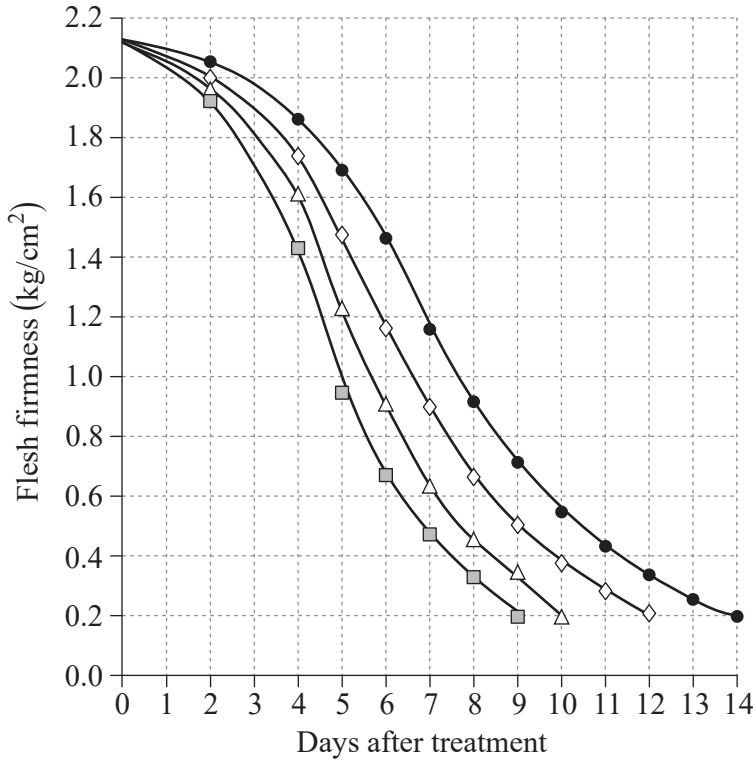
QUESTION 8 (5 marks)

An experiment was conducted to determine the relationship between the concentration of ethylene applied post harvest and the ripening of bananas.

The graphs show changes in weight loss and flesh firmness with different concentrations of ethylene.





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Draw a conclusion about the effect of ethylene on the ripening of bananas, referring to evidence of weight loss and flesh firmness.

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QUESTION 9 (4 marks)

The table shows results of a trial conducted to compare three different beef production systems: grain fed (GR), grass fed for 20 months (GF20) and grass fed for 25 months (GF25).

		GR	GF20	GF25
Performance and financial measurements	Average total gain (kg)	343	195	263
	Dressing percentage (%)	61.8	50.2	53.4
	Marbling score	421	285	333
	Total variable costs of production ($/kg HCW)	6.01	8.98	8.33
Environmental impacts	Water consumption (L)	933	465	625
	Energy input (MJ)	18.7	7.65	8.85
	Air pollution (ozone equivalent)	0.15	0.01	0.01

Determine which method of production is the most financially sustainable and which is the most environmentally sustainable. Refer to two pieces of evidence to support each decision.

Most financially sustainable: _____

Most environmentally sustainable: _____

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Section 2

Instructions

- Select **one** question from page 14 or 15.
- Indicate the question you have selected by filling in the bubble on page 16 completely.
- If you change your mind or make a mistake, draw a cross through the bubble you wish to change and fill in the new bubble completely.

  Example:

Question 10 ●	**Question 11** ⊗

- Respond in 300–350 words.
- This section has one question and is worth 16 marks.

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QUESTION 10 (16 marks)

Barber's pole worm (*Haemonchus contortus*) is a major parasite in the Queensland sheep industry (particularly where summer rainfall is dominant), with substantial problems associated with drench resistance costing the industry millions of dollars each year. Adult worms live inside the digestive tract of sheep and lay up to 10 000 eggs per day, which are passed in dung. With favourable (warm and moist) weather conditions, infective larvae hatch within 3–4 days and migrate up onto the stalks of pastures. They live within the bottom 7–8 cm of the pasture stalk and are subsequently ingested by grazing sheep, where they mature in the abomasum over 21 days. If they are ingested by grazing cattle or horses, they do not survive, due to differences within the digestive system.

The larvae require warm and moist environments within the lower section of the pasture but are susceptible to direct sunlight and fire, which will kill them.

Individual sheep demonstrate varied resistance to this parasite, with a heritability of worm resistance of at least 25%. Animals that have been exposed to this parasite tend to acquire a basic level of immunity; however, animals that are at greatest risk are weaners, ewes just prior to lambing, as well as those that have never been exposed to the parasite. The parasite causes issues including lethargy, weight loss, a break in the wool staple length, and a drop in milk production. It can also be fatal.

Regular faecal egg counts can give producers information on the current worm burden of their flock as well as that population's resistance to specific drenches. Several drenches are available (including short-acting, quarantine drenches and long-acting drenches); however, Queensland has seen major problems with Barber's pole worm resistance to some drenches. A vaccine has recently been developed, which has been useful in situations where severe drench resistance is evident; however, this vaccine is quite expensive.

Use the PPRR (Prevention, Preparedness, Response, Recovery) model to assess the risk of Barber's pole worm on sheep production. Describe two risk management strategies for each element of the PPRR model for Queensland sheep producers. Provide a justification for each management strategy.

OR

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QUESTION 11 (16 marks)

Net blotch (*Pyrenophora teres*) is a prevalent fungal disease of barley, which can cause considerable yield losses of up to 45% as well as reduced grain quality. Symptoms include brown spots and stripes on leaves, which reduce photosynthetic capacity and eventually result in death of leaf tissue.

The pathogen that causes the disease can enter the paddock via neighbouring plants or mulch, stubble and seed from previous crops. It can also infect and survive on other cereals such as wheat and oats. It reproduces via spores, which are dispersed via wind and water. These spores can remain active in soil and leftover stubble and mulch for up to two years but are susceptible to both fire and grazing by livestock. Barley sowing times should be carefully considered, as mild temperatures and prolonged wet weather are favoured by the pathogen, increasing its prevalence considerably.

Plants that experience poor health due to nutritional stress are more susceptible to the disease; however, excessive nitrogen concentrations within the plant can also increase its susceptibility due to the relative increase in leaf matter produced, which ultimately increases humidity levels in the canopy.

Along with many other diseases of the leaves, wet soils and intermittent frost can also cause physiological changes in leaves, which look similar to that caused by the net blotch pathogen, making a visual diagnosis difficult. Sampling and laboratory testing of affected leaves is the most effective and timely method of diagnosis.

Chemical controls of net blotch have historically been effective and can be applied at seeding as well as at critical times during plant development, when the plants are most susceptible to infection. Given that only a few chemicals are effective, continued use of some of these has resulted in the development of fungicide resistance among some net blotch pathogen populations.

Use the PPRR (Prevention, Preparedness, Response, Recovery) model to assess the risk of net blotch on barley production. Describe two risk management strategies for each element of the PPRR model for Queensland barley producers. Provide a justification for each management strategy.

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Fill in the bubble to indicate the question you have selected.

Question 10 ⬭	Question 11 ⬭

Prevention

Management strategy 1: _____

Management strategy 2: _____

Do not write outside this box.

Preparedness

Management strategy 1: _____

Management strategy 2: _____

Do not write outside this box.

Response

Management strategy 1: _____

Management strategy 2: _____

Do not write outside this box.

Recovery

Management strategy 1: _____

Management strategy 2: _____

END OF PAPER

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ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.

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ADDITIONAL PAGE FOR STUDENT RESPONSES

Write the question number you are responding to.

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References

Question 1

Adapted from Fig 1 in Meat & Livestock Australia (MLA) (2024). *Know your market specifications* https://mbfp.mla.com.au/meeting-market-specifications/1-know-your-market-specifications/

Question 2

Adapted from 'Cattle tick life cycle' diagram, Business Queensland. (2017). *Cattle tick*. https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/biosecurity/animals/diseases/guide/cattle-tick Licensed Creative Commons Attribution 4.0 (CC BY 4.0).