External assessment 2022

Agricultural Science

Paper 1

General instruction

• Work in this book will not be marked.
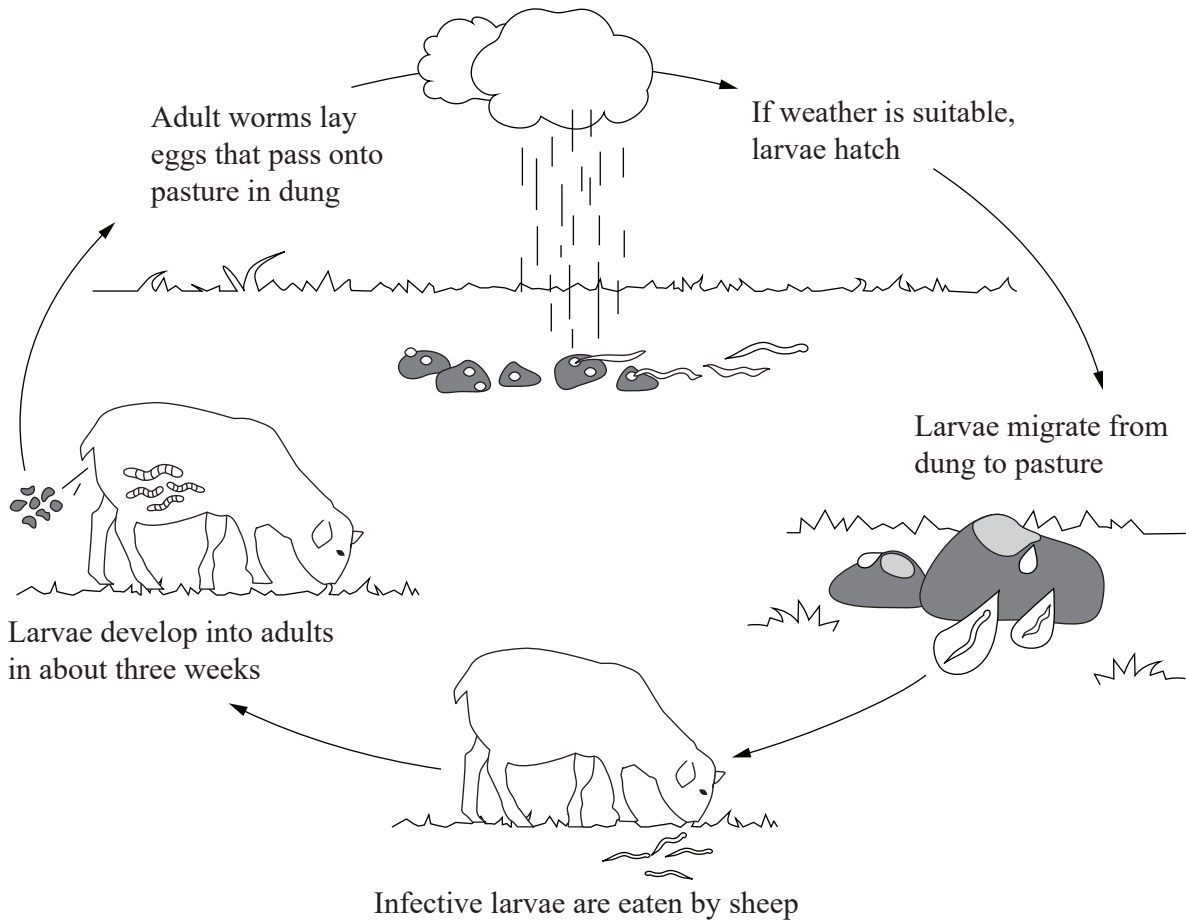
Queensland Government | QCAA Queensland Curriculum & Assessment Authority

Section 1

QUESTION 1

The diagram shows the life cycle of the barber's pole worm in sheep. A strategy to break the life cycle of a worm-infected paddock is to rotate sheep with horses.

How many weeks between sheep rotations would be the most suitable?

   (A)   one

   (B)   two

   (C)   three

   (D)   four

QUESTION 2

Fluctuation in the diameter of wool fibres of a purebred merino flock over a calendar year is mainly due to

    (A)   genetic variation among sheep.

    (B)   changes in the taste of leaf material.

    (C)   changes in temperature across the year.

    (D)   variation in the quality of available pasture.

QUESTION 3

The table shows a planting strategy for a producer planning to use the cotton variety Bollgard 3, which carries the Bt insecticidal protein. It includes refuge areas planted with non-Bt cotton and pigeon pea. Spraying of cotton is performed before bolling begins to ensure a threshold population is not reached and reduce the incidence of resistant moths.

Crop	Conditions	Area planted (ha)
Cotton	Irrigated, sprayed	100
Refuge cotton	Irrigated, unsprayed	5
Pigeon pea	Irrigated, unsprayed	2.5

What is the primary reason for this planting strategy in terms of integrated pest management?

    (A)   Either refuge crop allows breeding of non-resistant bollworm moths to dilute genetic resistance.

    (B)   Either refuge crop will attract most of the bollworm moths away from most of the cotton.

    (C)   Pigeon pea is planted to provide a refuge for predatory insects of the bollworm moth.

    (D)   Pigeon pea is planted to improve the nutrient profile of the soil.

QUESTIONS 4–5

These questions refer to the data in the table, which shows selected expenses for a merino enterprise.

Expenses	$
Depreciation	32 876
Seed	9456
Fertiliser	23 657
Harvesting	14 690
Rates	4789
Mustering	10 000
Vaccines	17 800
Shearing	27 549
Loan repayments	36 155
Total farm expenses	176 972

QUESTION 4

Which expense is a fixed cost?

    (A) seed

    (B) shearing

    (C) harvesting

    (D) depreciation

QUESTION 5

Determine the total variable expenses in the table.

    (A) $93 152

    (B) $103 152

    (C) $107 941

    (D) $136 028

QUESTION 6

The table shows estimated breeding values for live weight gain and reproductive characteristics for a sample of bulls.

Identify which bull a producer should buy, to sell two-year-old steers earlier at the minimum market live weight and improve female fertility.

Bull	400-day weight	600-day weight	Scrotal size	Days to calving
(A)	+46	+57	+1.8	+8
(B)	+42	+40	+2.1	−8
(C)	+36	+59	+1.5	−7
(D)	+38	+50	+2.4	+10

QUESTION 7

The first stage of fat digestion (excluding volatile fatty acids) in mature cattle occurs in the

(A) small intestine.

(B) abomasum.

(C) omasum.

(D) rumen.

QUESTION 8

An increase in the price of red meat in Queensland domestic markets will occur after

(A) a 12-month period of continuous negative southern oscillation values.

(B) an increase in customer demand for alternative vegan products.

(C) a decrease in the quota allowed for live export of cattle.

(D) above average rainfall totals across production areas.

QUESTION 9

The graph shows a change in the supply and demand of apples.
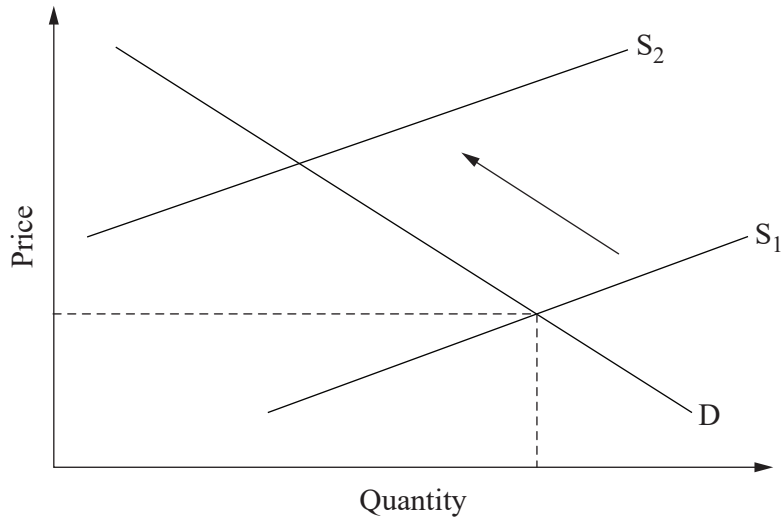
Which statement best describes the change in the supply (S), demand (D) and price of apples?

(A) A marketing campaign increased the demand for apples.

(B) Production losses in the major growing areas decreased supply.

(C) Increasing production costs reduced the supply for a given price.

(D) New technology reduced the cost for farmers and increased supply.

QUESTION 10

Select the combination of processes that best describes the role of microscopic organisms in the rumen.

	Process 1	Process 2
(A)	Absorption of nitrogen	Absorption of carbohydrates
(B)	Conversion of carbohydrates to volatile fatty acids	Conversion of nitrogen to microbial protein
(C)	Degradation of protein to amino acids	Conversion of carbohydrates to volatile fatty acids
(D)	Conversion of nitrogen to microbial protein	Absorption of carbohydrates

QUESTION 11

The diagram shows the nitrogen cycle.
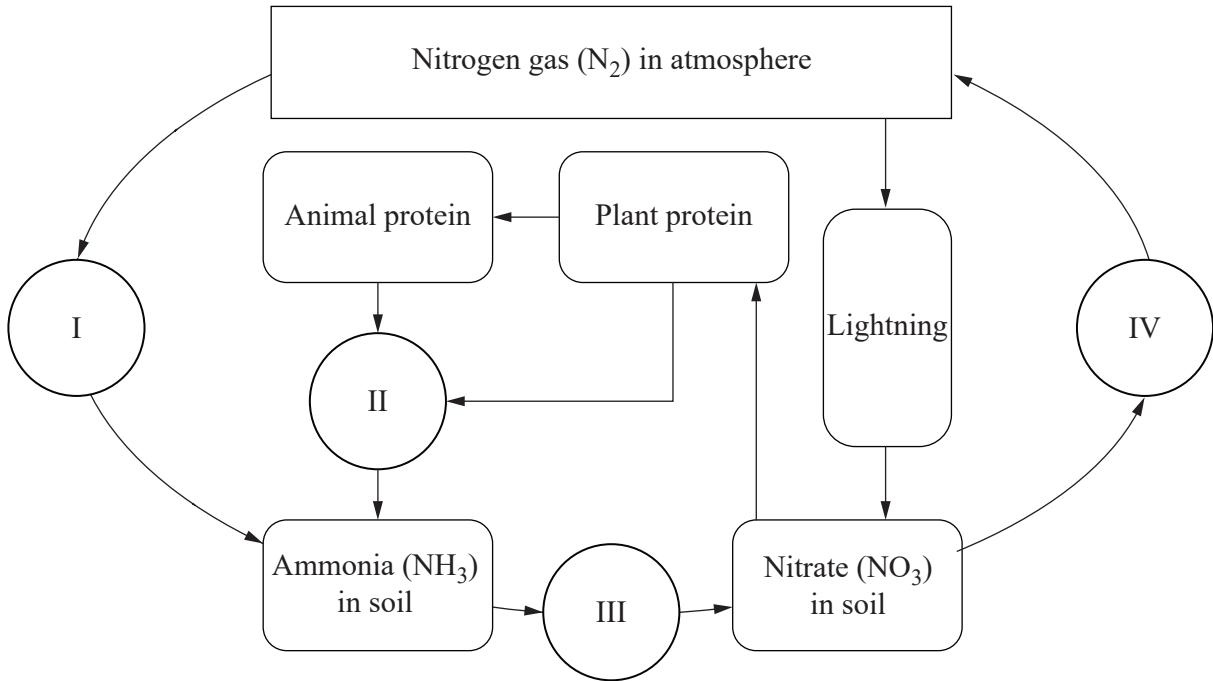
The organisms responsible for the process occurring at point I in the diagram are

(A) nitrifying bacteria.

(B) denitrifying bacteria.

(C) decomposing bacteria.

(D) nitrogen-fixing bacteria.

QUESTION 12

A beef producer expanded their business by constructing a feedlot on their breeding property.

What element of standard operating procedures for cattle in Queensland must now be a higher priority for intensive animal production?

(A) yard flooring

(B) humane killing

(C) water requirements

(D) transport and travel distance

QUESTION 13

What function does abscisic acid perform in plants?

(A) inhibiting growth

(B) stimulating root growth

(C) decreasing internodal length

(D) increasing rate of ripening fruit

QUESTION 14

Protein functions in ruminant animals include

(A) increasing marbling in meat and providing energy for muscle development.

(B) enabling chemical reactions and production of genetic material.

(C) improving water retention and increasing faecal output.

(D) improving energy output in cells and urinary function.

QUESTION 15

A characteristic of an unsustainable biological control method is

(A) a narrow host range for the biological control organism.

(B) an increase in the population of the competing species.

(C) the disappearance of the biological control organism.

(D) a reduction in the population of the targeted pest.

QUESTION 16

The graphs show the volume of exports and domestic consumption for total agricultural production, along with two agricultural industries. The table shows the value of production for these two industries.
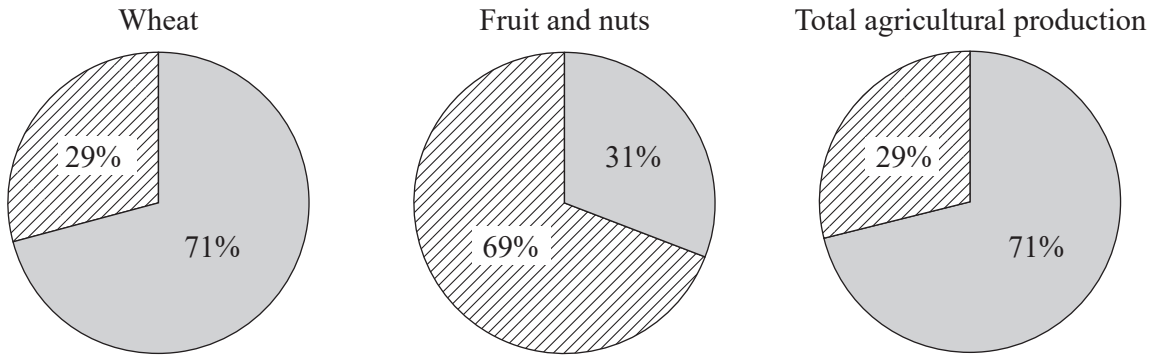
Wheat | Fruit and nuts | Total agricultural production

Agricultural industry	Value of production (%)
Wheat	8
Fruit and nuts	8

In negotiations for a Free Trade Agreement between Australia and Indonesia, why would Australia insist on including wheat rather than fruit and nuts?

(A) Wheat production is much greater than fruit and nut production.

(B) Australia has a larger export market for wheat compared to fruit and nuts.

(C) Larger areas of regional Australia are planted with wheat than fruit and nuts.

(D) Domestic demand for fruit and nuts makes their export less attractive compared to wheat.

QUESTION 17

An experiment tested the effect of a hormone applied to dwarf peas at three different concentrations.
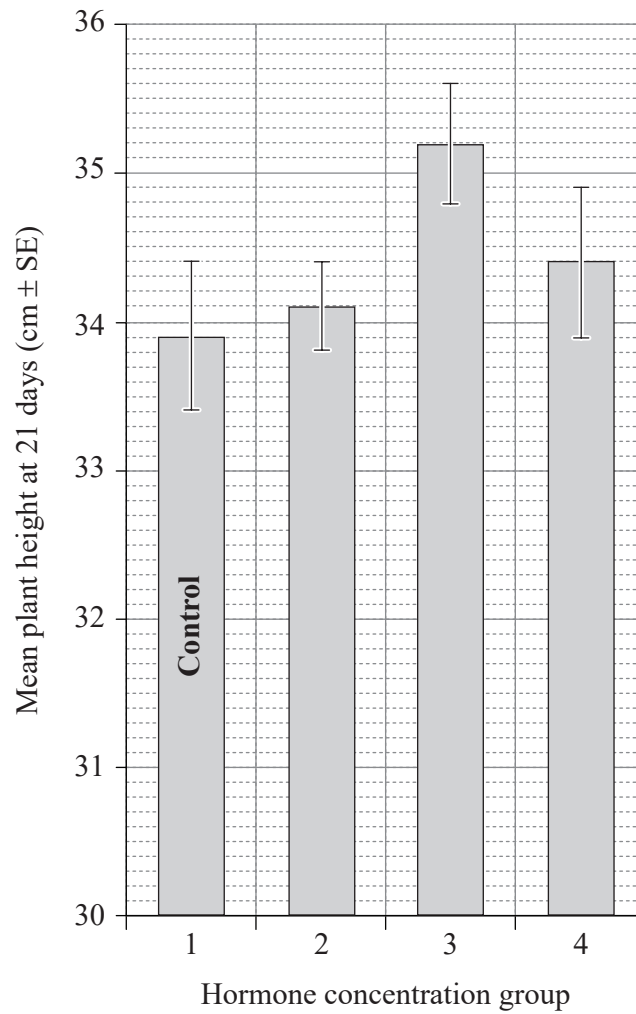
After 21 days, on average plants in

(A) group 1 grew less than group 2.

(B) group 4 grew less than group 3.

(C) group 3 grew more than group 1.

(D) group 4 grew more than group 1.

QUESTION 18

Controlled traffic as a land management practice in agricultural production is used to

(A) reduce soil compaction.

(B) improve the soil microbiology.

(C) increase organic matter in the soil by retaining stubble.

(D) incorporate matching land capabilities for long-term sustainability.

QUESTION 19

What most effectively reduces turbidity levels in creeks located in extensive cattle operations?

(A) building weirs or dams

(B) erecting stock fences around the creek

(C) reducing fertiliser run-off from paddocks

(D) implementing a rotational grazing strategy

QUESTION 20

The table shows the gross margin for a dairy enterprise that runs 300 cows on 120 hectares.

Gross income	$890 000
Variable cost	$650 000
Gross margin	$240 000

Identify the change of input that would cause the greatest effect on gross margin for the enterprise.

(A) fertiliser costs increasing from $120/ha to $165/ha

(B) animal health costs increasing from $60/cow to $85/cow

(C) fixed cost of labour increasing from $120 000 to $130 000

(D) council rates increasing from $45 000 per year to $65 000 per year

References

Question 1

Cotter, J 2018, Barber's pole worm in sheep, Western Australia Department of Primary Industries and Regional Development, www.agric.wa.gov.au/livestock-parasites/barbers-pole-worm-sheep.

Question 3

Data sourced from Table 1, 'Irrigated Bollgard 3 cotton refuge options' in CRDC and CottonInfo 2020, *Cotton pest management guide 2020–21*, p. 74, www.crdc.com.au/sites/default/files/pdf/CPMG%202020%20 interactive.pdf.

Question 16

Data sourced from ABARES 2020, *Analysis of Australia's Food Security and the COVID-19 Pandemic*, www.agriculture.gov.au/abares/products/insights/australian-food-security-and-COVID-19. Used under the Creative Commons Attribution (CC-BY) 4.0 licence.