NSW Education Standards Authority

2019 **HIGHER SCHOOL CERTIFICATE EXAMINATION**

Agriculture

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Write using black pen
- Draw diagrams using pencil
- Calculators approved by NESA may be used

Total marks: 100

Section I – 80 marks (pages 2–24)

This section has two parts, Part A and Part B

Part A – 20 marks

- Attempt Questions 1–20
- Allow about 30 minutes for this part

Part B – 60 marks

- Attempt Questions 21–27
- Allow about 1 hour and 45 minutes for this part

Section II – 20 marks (pages 25–26)

- Attempt ONE question from Questions 28–30
- Allow about 45 minutes for this section

Section I
80 marks

Part A – 20 marks
Attempt Questions 1–20
Allow about 30 minutes for this part

Use the multiple-choice answer sheet for Questions 1–20.

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1 Consider the marketing chain where *X* represents the end of the chain.

What does *X* represent?

A. Advertiser

B. Consumer

C. Processor

D. Transporter

2 An extract from a pre-emergent herbicide label is shown.

Crop/situation	*Weeds controlled*	*State*	*Rate*
Sweet corn	Barnyard grass, Crowsfoot grass	All states	1 L/ha
	Fat Hen, Summer grass, Rhodes grass	All states	1.5 L/ha
Green beans	Summer grass, Barnyard grass, Crowsfoot grass	All states	2.0 L/ha
Sweet potato	Fat Hen, Rhodes grass, Barnyard grass	All states	0.5 L/ha

A farmer is growing a crop of sweet corn and wants to control the weed Fat Hen.

How much herbicide is required to treat five hectares of sweet corn?

A. 1.5 L

B. 2.5 L

C. 5.0 L

D. 7.5 L

3 Which nutrient is associated with the nodules on the roots of a legume plant?

A. Calcium

B. Nitrogen

C. Phosphorus

D. Potassium

4 Which component of an integrated pest management (IPM) program would be most likely to cause resistance in a pest population?

A. Biological agents

B. Cultural practices

C. Physical practices

D. Chemical applications

5 Which of the following is an example of *value adding*?

A. Selling beef to a Japanese market

B. Selling whole milk through a cooperative

C. Selling vegetables directly to a restaurant

D. Selling mixed leafy greens at the farm gate

6 Which hormone is responsible for the behaviour known as *standing heat*?

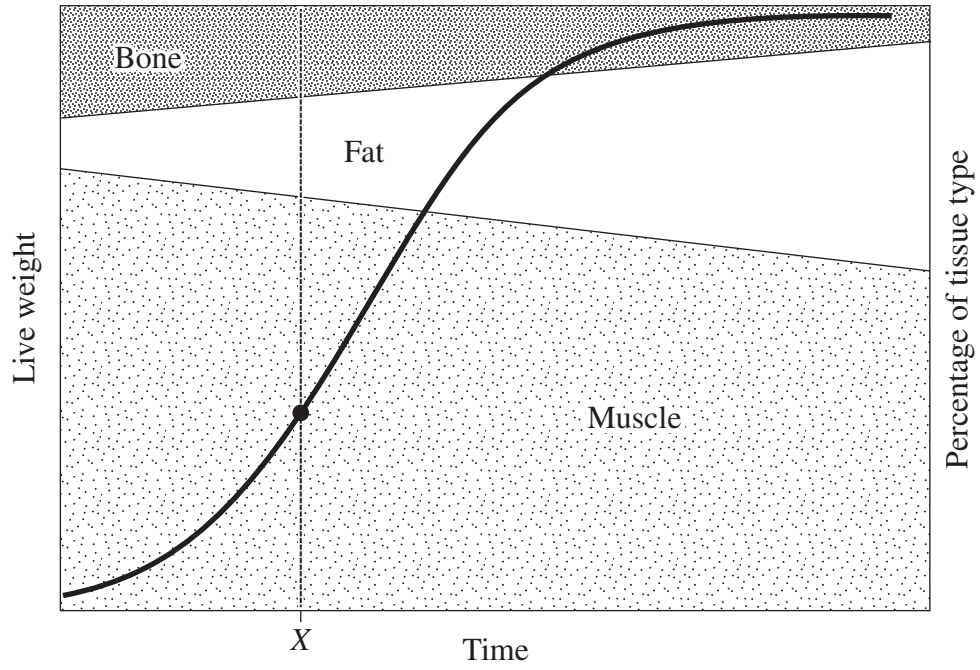
A. Oestrogen

B. Progesterone

C. Prostaglandin

D. Testosterone

7 The diagram shows a growth curve and the changes in the proportion of muscle, total fat and bone during the growth of an animal from birth.



Which of the following best describes the carcase of an animal slaughtered at time *X*?

A. Fat and low weight

B. Fat and high weight

C. Lean and low weight

D. Lean and high weight

8 The tables show the protein requirements needed by a dairy cow for maintenance and for milk production.

Protein requirement for maintenance

Bodyweight (kg)	*Daily protein requirement* (g/day)
300	288
350	324
400	358
450	391
500	423
550	454

Additional protein requirement for milk production

Milk quality (fat %)	*Protein requirement* (g/kg of milk)
3.4	81
3.6	82
4.0	85

A 450 kg dairy cow produces 30 kg of milk with 3.4% fat per day.

What is the daily protein requirement for this cow?

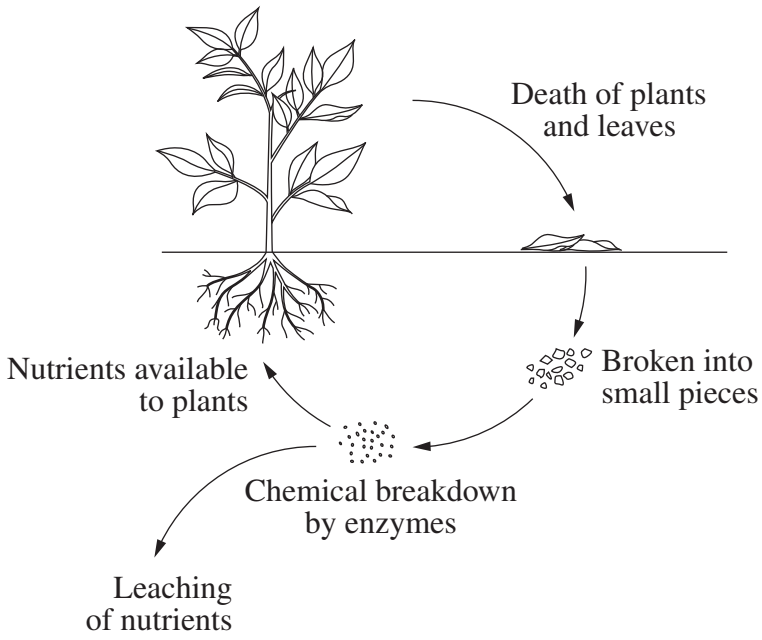
A. 391 g

B. 472 g

C. 2430 g

D. 2821 g

9 The diagram shows some steps in a nutrient cycle.



Which of the following shows a pair of steps in the cycle where both steps involve soil invertebrates?

A. Broken into small pieces and Leaching of nutrients

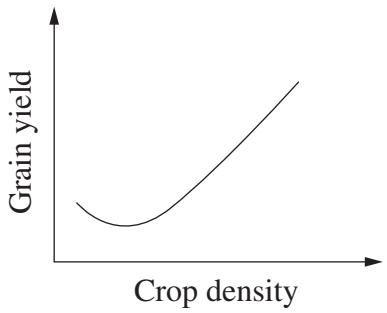
B. Leaching of nutrients and Nutrients available to plants

C. Broken into small pieces and Chemical breakdown by enzymes

D. Chemical breakdown by enzymes and Nutrients available to plants

10 Which graph best shows the relationship between crop density and grain yield?

A.



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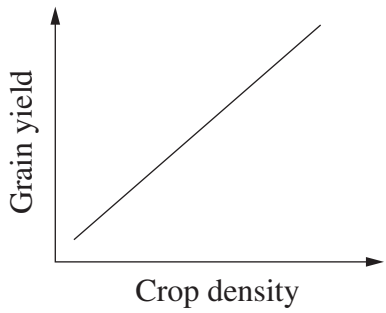

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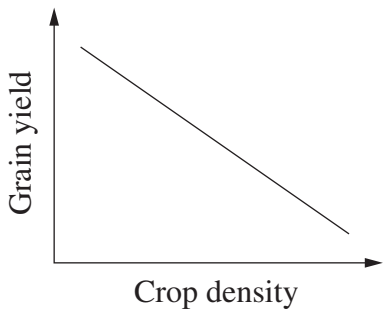

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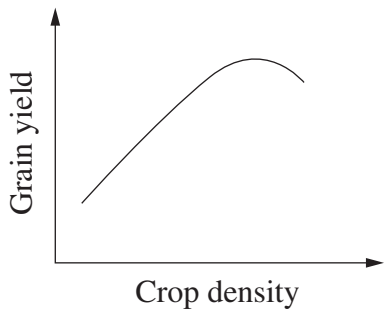


11 Which plant hormone stimulates root growth?

A. Auxin

B. Cytokinin

C. Ethylene

D. Gibberellin

12 What is the role of standardisation of conditions in experimental design?

A. To test the significance of experimental results

B. To increase validity by providing a large sample size

C. To provide a basis of comparison to treatment results

D. To reduce variability due to external non-treatment factors

13 When using an objective measurement such as estimated breeding values (EBVs) in an animal breeding program, which of the following is NOT a major consideration?

A. Current herd performance

B. Detecting defective genes

C. The environment experienced by the herd

D. The market specification for the end product

14 Which of the following describes the duration and nature of whole-farm planning?

	Duration	*Nature*
A.	Long term	Flexible
B.	Long term	Fixed
C.	Short term	Flexible
D.	Short term	Fixed

15 Which row of the table identifies the features of a riparian zone?

	Buffer between a body of water and land	*Rich in biodiversity*	*Increases nitrogen for future cropping*	*Protects water quality*
A.	Yes	Yes	Yes	No
B.	Yes	Yes	No	Yes
C.	Yes	No	Yes	Yes
D.	No	Yes	Yes	Yes

16 Which of the following is NOT a purpose of oestrus synchronisation in livestock reproduction?

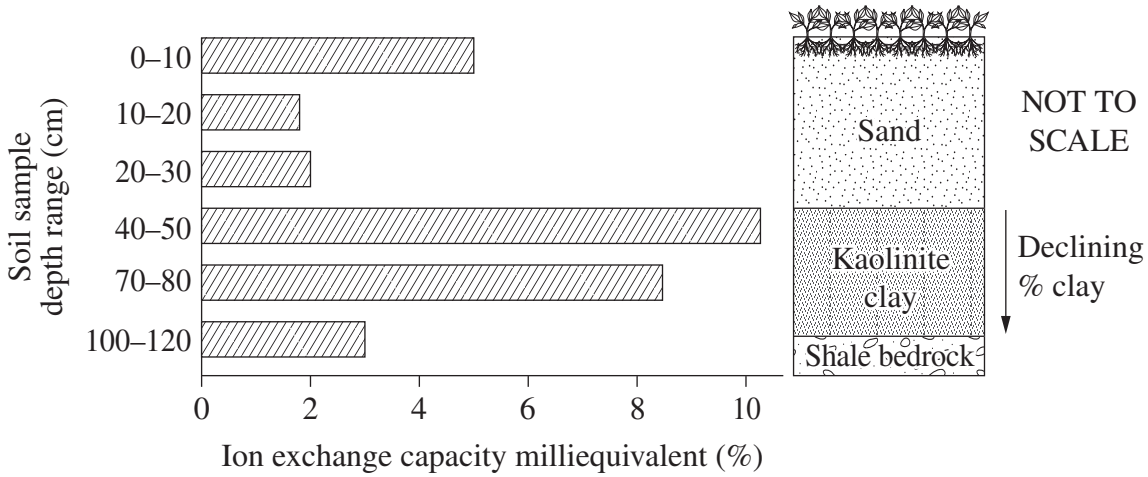
A. To enable the production of multiple embryos

B. To ensure offspring are born at a similar time

C. To manipulate the oestrus cycles of donor and recipient females to enable embryo transfer

D. To increase the predictability of the female cycle to allow efficient artificial insemination

17 The diagram shows the ion exchange capacity of random soil samples taken from a duplex soil with an upper sandy layer and a clay layer beginning at a depth of 40 cm. The surface is densely vegetated and rich in organic matter.



Which pair of factors most influences this soil's ability to retain nutrients in a form available to plants?

A. Soil depth and percentage of clay particles

B. Soil depth and percentage of sand particles

C. Organic matter and percentage of clay particles

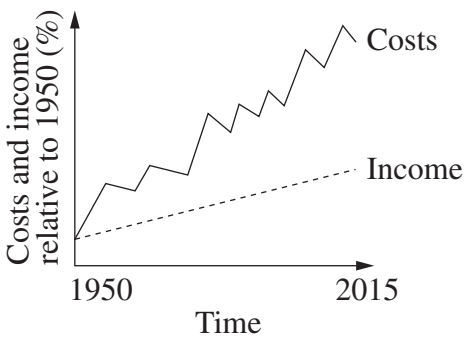
D. Organic matter and percentage of sand particles

18 Data on farm costs and income have been collected over a long period of time.

1950 was taken as a base year and the costs and income as a percentage of the 1950 values were graphed for subsequent years.

Which of the following best depicts the general trends in the relative changes in farm costs and income over time?

A.



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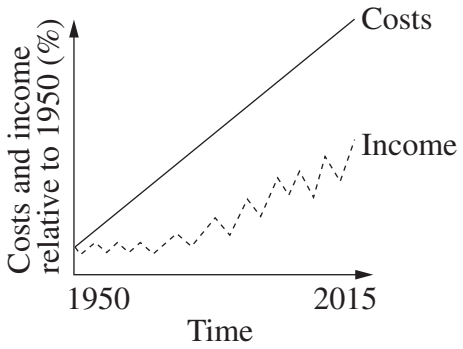

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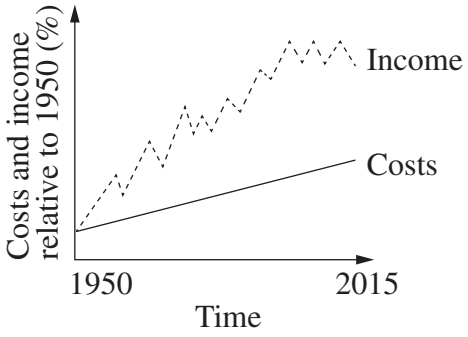

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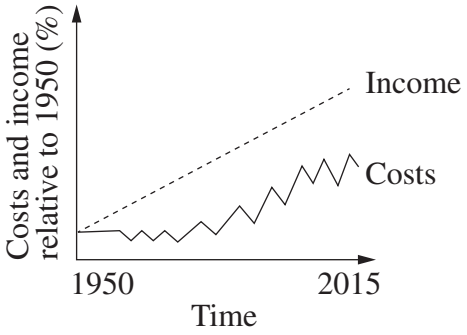
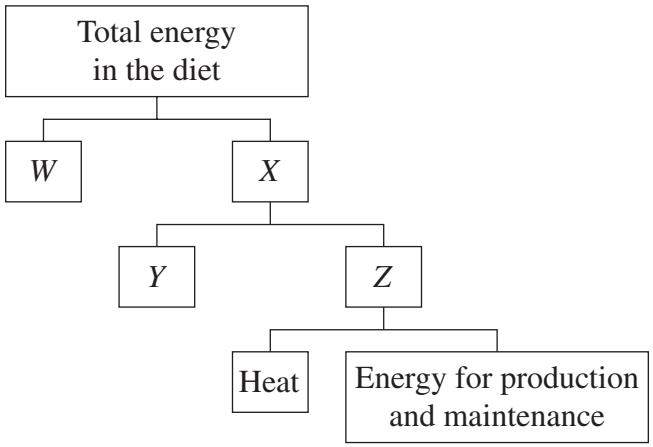


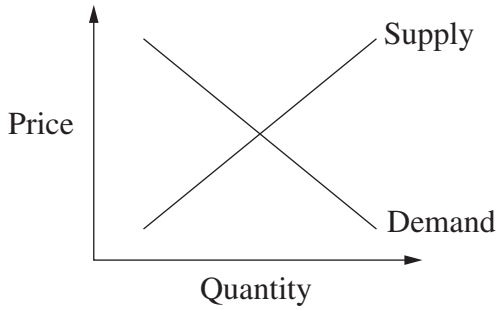
19 The diagram shows the fate of energy which is ingested by a ruminant animal.



What are the correct labels for *W*, *X*, *Y* and *Z*?

	W	*X*	*Y*	*Z*
A.	Faeces	Digestible energy	Methane	Metabolisable energy
B.	Faeces	Metabolisable energy	Methane	Digestible energy
C.	Methane	Digestible energy	Faeces	Metabolisable energy
D.	Methane	Metabolisable energy	Faeces	Digestible energy

20 The diagram shows supply and demand curves.



A new technology which significantly reduces the cost of production of a farm product becomes available to farmers.

How is this most likely to affect the supply or the demand curve?

A. The supply curve will shift to the left

B. The demand curve will shift to the left

C. The supply curve will shift to the right

D. The demand curve will shift to the right

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2019 HIGHER SCHOOL CERTIFICATE EXAMINATION

Centre Number

Student Number

Agriculture

Section I Part B
Answer Booklet

60 marks
Attempt Questions 21–27
Allow about 1 hour and 45 minutes for this part

Instructions

- Write your Centre Number and Student Number at the top of this page.
- Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.
- Show all relevant working in questions involving calculations.
- Extra writing space is provided at the back of this booklet. If you use this space, clearly indicate which question you are answering.

Please turn over

Question 21 (11 marks)

(a) Outline *family farm* and *corporate enterprise* as types of farm business structures. **3**

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(b) Outline strategies that are available to farmers to reduce financial pressure. **4**

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(c) Discuss *direct marketing* as a strategy available to farmers. **4**

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Question 22 (6 marks)

(a) Name TWO physical characteristics of soil. **2**

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(b) Describe a method that can be used to test ONE specific physical or chemical characteristic of soil. **4**

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Please turn over

Question 23 (6 marks)

(a) Outline the importance of ongoing research related to agricultural industries. **2**

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(b) Describe the impact of a recently-developed technology on agricultural production and/or marketing. In your answer, specify the technology. **4**

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Question 24 (9 marks)

(a) Describe the impact of ONE Aboriginal land use practice. **3**

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(b) Explain how TWO techniques are currently used to sustainably manage soil fertility on farms. **6**

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Question 25 (11 marks)

(a) A student is to perform an investigation to determine the effect of light on plant growth. **3**

Outline an experimental design that could be used for this investigation.

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(b) Explain management techniques that farmers can use to overcome TWO environmental constraints on photosynthesis. **4**

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Question 25 continues on page 19

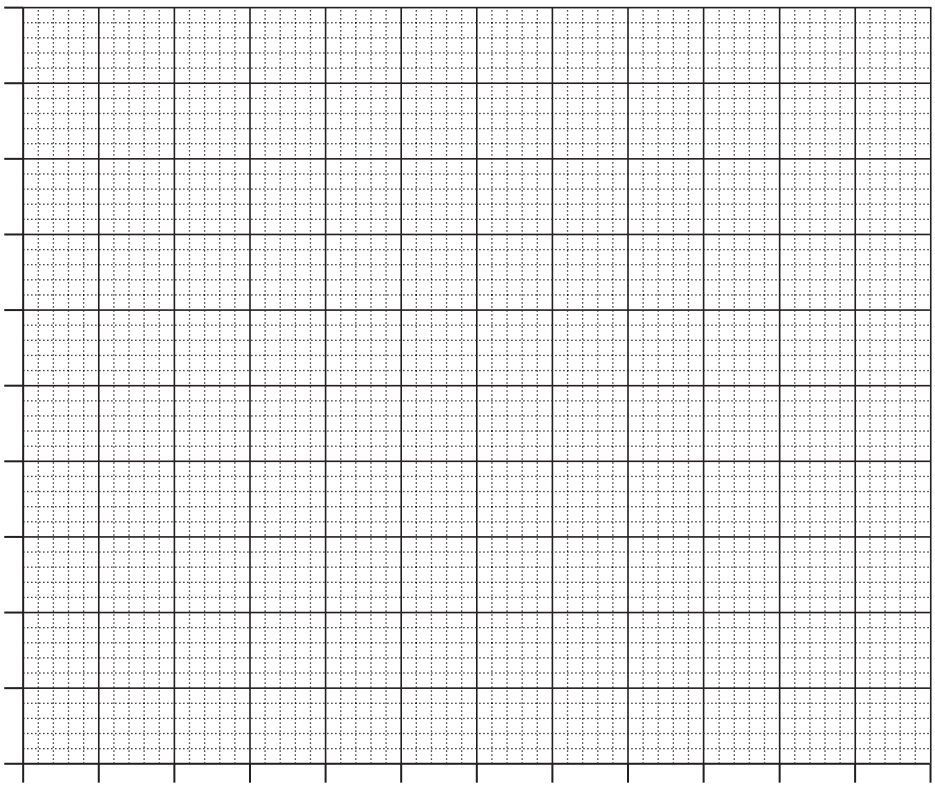
Question 25 (continued)

(c) An experiment was carried out to determine the effect of crop density on plant dry matter yield. **4**

The table shows the results of one of the density treatments in the trial.

Time (weeks)	*Average dry matter yield* (g)
1	50
2	180
3	450
4	870

Construct a graph to represent the data given in this table.



End of Question 25

Question 26 (6 marks)

Evaluate the management strategies used to meet a market specification with reference to a product you have studied. **6**

Name of product .....

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Question 27 (11 marks)

(a) Outline the meaning of the term *heritability* in relation to animal breeding. **2**

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(b) Why would a farmer choose to use line breeding in an animal production system? **3**

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Question 27 continues on page 22

(c) Discuss the use of hormone growth promotants (HGPs) in animal production in terms of productivity AND animal welfare. **6**

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End of Question 27

Section I Part B extra writing space

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Section I Part B extra writing space

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Agriculture

Section II

20 marks
Attempt ONE question from Questions 28–30
Allow about 45 minutes for this section

Answer the question in the Section II Writing Booklet. Extra writing booklets are available.

Your answers will be assessed on how well you:

- demonstrate knowledge and understanding relevant to the question
- communicate ideas and information using relevant examples
- present a logical and cohesive response

Question 28 — Agri-food, Fibre and Fuel Technologies (20 marks)

Answer part (a) of the question on pages 2–4 of the Writing Booklet.

(a) In this elective, you analysed a research study on the development and/or the implementation of ONE agricultural biotechnology.

In your writing booklet, identify this research study.

(i) What was the aim of the research study? **2**

(ii) Justify TWO aspects of the methodology of the research study. **6**

Answer part (b) of the question on pages 5–8 of the Writing Booklet.

(b) Discuss the use of genetically modified organisms (GMOs) in food production. **12**

OR

Please turn over

Question 29 — Climate Challenge (20 marks)

Answer part (a) of the question on pages 2–4 of the Writing Booklet.

(a) In this elective, you analysed a research study on climate variability or management strategies related to climate variability.

In your writing booklet, identify this research study.

(i) What was the aim of the research study? **2**

(ii) Justify TWO aspects of the methodology of the research study. **6**

Answer part (b) of the question on pages 5–8 of the Writing Booklet.

(b) Discuss management strategies farmers can use to deal with climate variability. **12**

OR

Question 30 — Farming for the 21st Century (20 marks)

Answer part (a) of the question on pages 2–4 of the Writing Booklet.

(a) In this elective, you analysed a research study on the development and/or the implementation of ONE recent agricultural technology.

In your writing booklet, identify this research study.

(i) What was the aim of the research study? **2**

(ii) Justify TWO aspects of the methodology of the research study. **6**

Answer part (b) of the question on pages 5–8 of the Writing Booklet.

(b) Discuss the impact of ONE recent technological development in terms of both economic factors and managerial factors. **12**

End of paper