NSW GOVERNMENT

NSW Education Standards Authority

Centre Number

Student Number

2023 **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
- Write your Centre Number and Student Number at the top of this page

Total marks: 100

Section I – 80 marks (pages 2–27)

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 29–30)

- 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 Which of the following statements is true of traditional Aboriginal land use practices?

A. They all involved burning of vegetation.

B. Natural waterways were not manipulated.

C. A more diverse range of native plant species evolved as a result.

D. They were more sustainable than early European settlers' practices.

2 The space in soil between mineral particles, which may contain either air or water, is called

A. texture.

B. porosity.

C. structure.

D. bulk density.

3 Which of these statements describes *contract selling*?

A. A strategy where a farmer sells their product straight to the consumer

B. An organisation that is set up by government for purchasing, marketing and selling a commodity

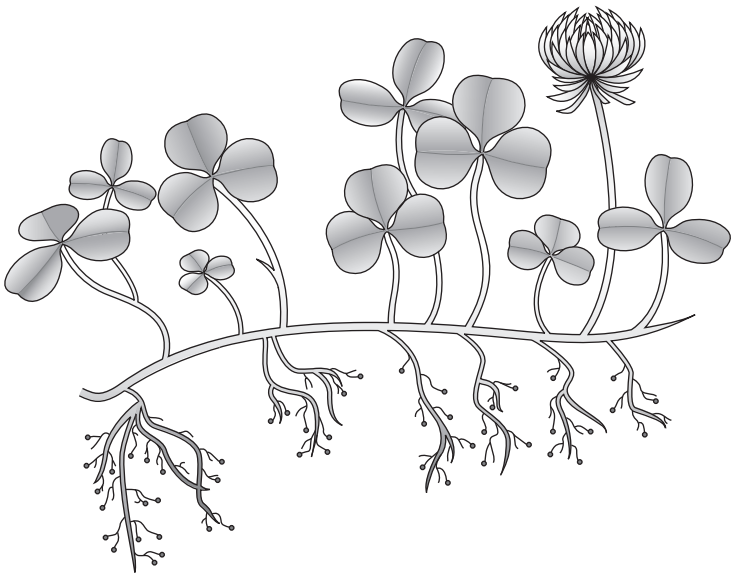
C. An agreement between a farmer and a buyer to purchase an agreed amount of product of a given quality

D. A group of producers who collectively own and control the purchasing, distribution and marketing of their products

4 Which of these lists contains ONLY measures of product quality?

A.	The shape of a banana Fat percentage of milk Protein content of wheat
B.	Weight of a merino fleece Fat depth of a beef carcase Litres of milk produced by a dairy cow
C.	The shape of a banana Length of a wool fibre Litres of milk produced by a dairy cow
D.	Colour of a capsicum Fat depth of a beef carcase Yield per hectare of canola

5 The diagram shows a plant.



Which of the following best describes this plant?

A. A grass that is high in energy

B. A legume that is low in protein

C. A grass that aids soil nitrogen fixation

D. A legume that aids soil nitrogen fixation

6 How should effluent from intensive livestock production be managed sustainably on a farm?

A. It should be collected and stored permanently in a dam.

B. It should be cleared from paddocks, pens and walkways.

C. It should be treated and spread on paddocks as a fertiliser.

D. It should be dried and burnt to reduce the risk of disease spread.

7 Which of the following is the best way to use chemicals to manage pests in a crop?

A. Spray the crop at two-weekly intervals

B. Monitor the crop and spray as soon as pests are detected

C. Spray the crop after every rainfall event to ensure good chemical coverage

D. Monitor the crop and spray if crop losses are expected to exceed chemical costs

8 Which of the following pairs of environmental constraints is best managed by changing plant variety?

A. Wind and O_2/CO_2 ratio

B. Wind and available moisture

C. Temperature and O_2/CO_2 ratio

D. Temperature and available moisture

9 Which of the following is NOT true about rumen microbes?

A. They produce methane and carbon dioxide as by-products.

B. They are digested in the omasum to release energy for the animal.

C. They use energy released from digested carbohydrates for their own metabolic needs.

D. They ferment carbohydrates to release volatile fatty acids (VFAs) for absorption through the rumen wall.

10 Which factor should be considered to reduce negative impacts on an animal when husbandry practices are carried out on a farm?

A. The cost of the husbandry practice

B. The consumer preferences for an animal product

C. The skill of the operator carrying out the practice

D. The premium received for undertaking the husbandry practice

11 A flood has occurred in an area where a vegetable crop is grown.

What would be the immediate effect on the market?

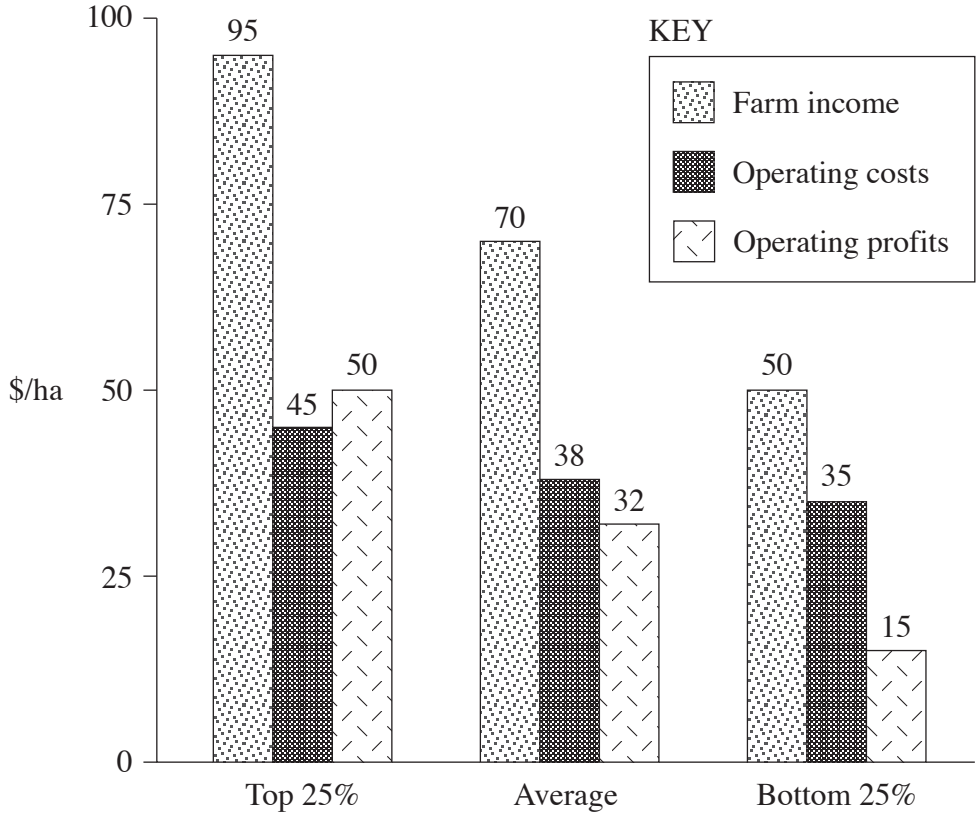
A. Increased supply

B. Decreased supply

C. Increased demand

D. Decreased demand

12 The diagram shows Broadacre Farm profits 2021–2022.



Farms operating in the top 25% are successful because they

A. have the lowest profit relative to costs.

B. manage risk to have the lowest operating costs.

C. control fluctuating income to decrease financial pressures.

D. generate high income despite having the highest overall costs.

13 Which of the following contains ONLY organic fertilisers that can be used to improve soil fertility?

A. Animal manure, lucerne mulch, seaweed, worm castings

B. Animal manure, limestone, superphosphate, worm castings

C. Ammonium sulfate, lucerne mulch, seaweed, superphosphate

D. Ammonium sulfate, animal manure, rock phosphate, seaweed

14 Why are new crop varieties developed for use in Australia?

A. To improve the quality, yield and environmental adaptation

B. To allow farmers to increase their profits by significantly reducing the costs of seed

C. To ensure seed companies can control production by preventing farmers using saved seeds

D. To enable seed companies to remain competitive by continually introducing new crop varieties onto the market

15 The table shows two definitions of animal breeding terms.

X	*Y*
The proportion of variation in a population trait that can be attributed to inherited genetic factors	The relative worth of an animal to a breeding program with the aim to improve a desired quality

Which row of the table below correctly identifies *X* and *Y*?

	X	*Y*
A.	Genotype	Line breeding
B.	Heritability	Line breeding
C.	Genotype	Objective measurement
D.	Heritability	Objective measurement

16 Why does resistance to agricultural pesticides develop in pest populations?

A. Some types of pesticides are not as efficient in killing pests, allowing more pests to survive and reproduce.

B. Producers who use the same pesticides all the time enable the pests to survive and reproduce at a greater rate.

C. Variations in genes in a pest population allows some pests to survive pesticides and pass these genes onto subsequent generations.

D. Incorrect application methods allow some pests to avoid contact with the pesticides, therefore breeding the next resistant generation.

17 The rate of both photosynthesis and respiration in plants increases as the temperature rises.

Which set of day and night temperatures would provide the highest net assimilation rate (NAR) for a crop?

	Day temperature	*Night temperature*
A.	Warm	Cool
B.	Warm	Warm
C.	Cool	Warm
D.	Cool	Cool

Refer to the following to answer Questions 18–19.

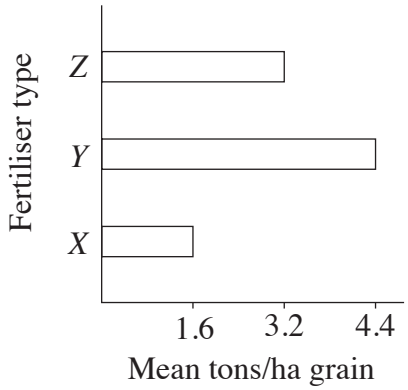
A trial was conducted to test the effect of fertiliser types on the yield of grains in a crop. Each treatment had 100 samples.

The following data was recorded.

	Fertiliser type		
	X	*Y*	*Z*
Mean tons/ha grain	1.6	4.4	3.2
Standard deviation	1.5	0.6	0.4

18 Which graph accurately represents this data?

A.



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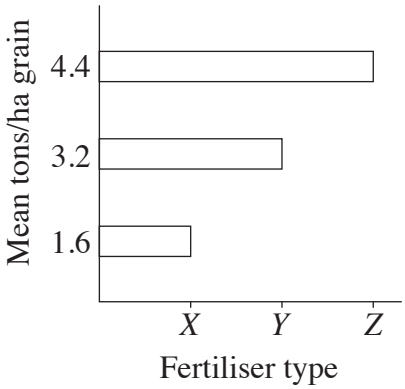

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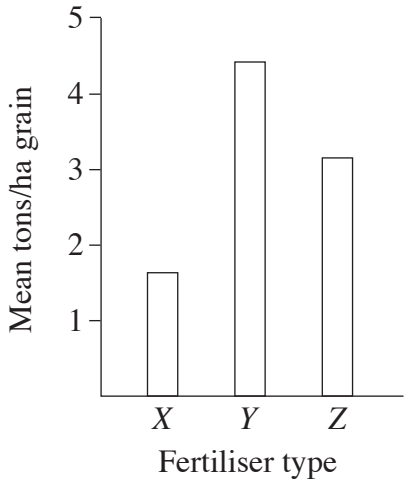
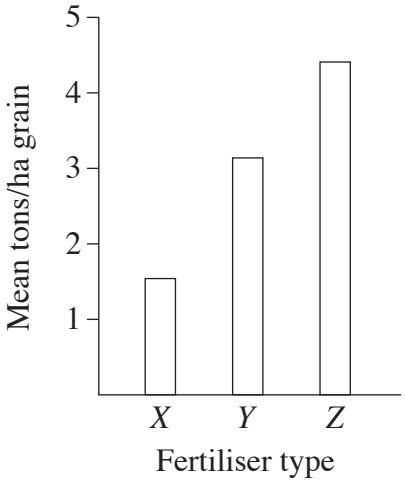


D.



19 What could be concluded from this data?

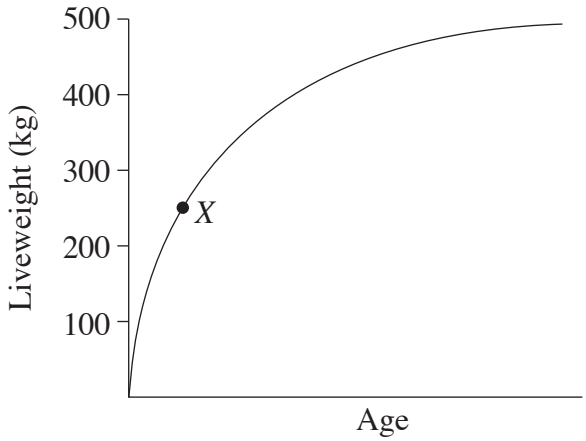
A. The variability of *Z* is too low to trust the results.

B. The variability of *X* is too high to trust the results.

C. *Z* is the best fertiliser as standard deviation is lowest.

D. *X* is the best fertiliser as standard deviation is highest.

20 The following graph and tables give information on the feed requirements and growth stages for cattle.



Liveweight (kg)	*Metabolisable energy* MJ/kg dry matter per day
100	36
250	44
350	56
450	59

Feed component	*Metabolisable energy* MJ/kg dry matter basis
Molasses	6.5
Cottonseed meal	11.9
Barley	10.1
Sorghum	10.8

Which row of the table identifies the ration that would provide the daily energy required for the animal marked as *X* on the graph?

	Molasses	*Cottonseed meal*	*Barley*	*Sorghum*
A.	0.5 kg	1.0 kg	1.0 kg	1.0 kg
B.	1.0 kg	1.0 kg	3.0 kg	1.0 kg
C.	1.0 kg	1.0 kg	2.0 kg	0.5 kg
D.	1.5 kg	0.5 kg	1.0 kg	1.0 kg

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2023 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

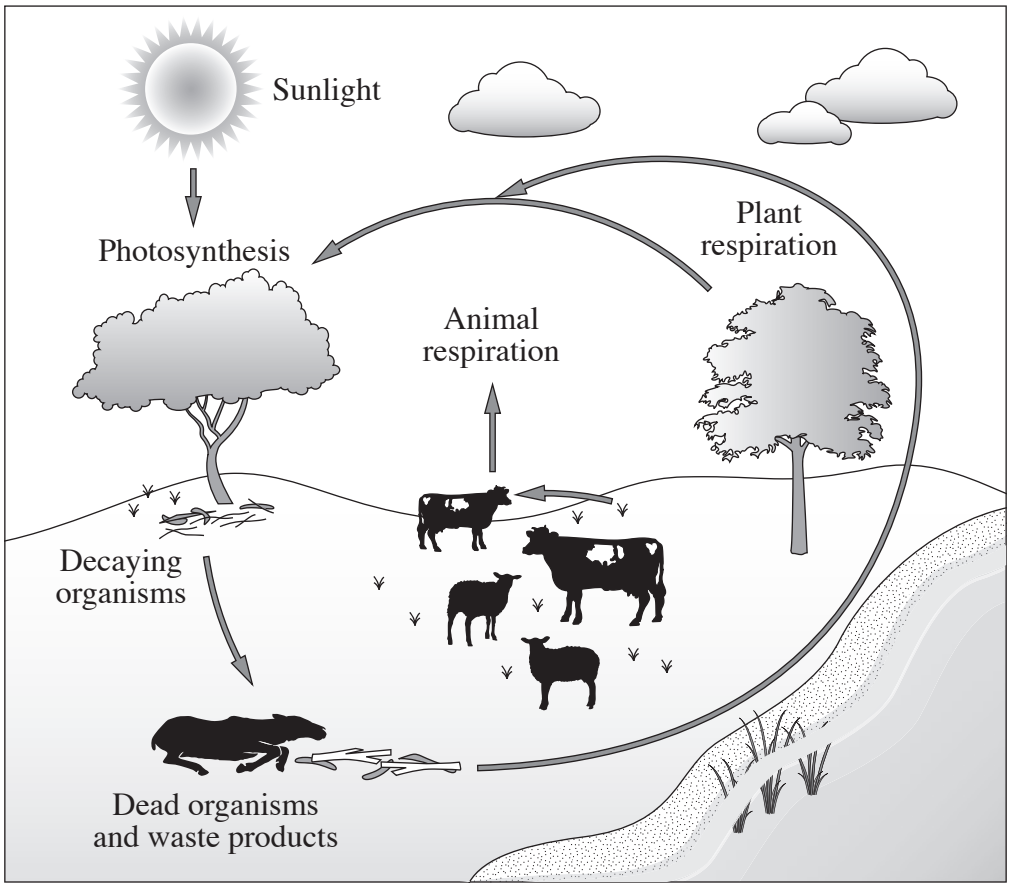
Instructions

- 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 (6 marks)

Use the diagram to answer parts (a) and (b).



(a) (i) Identify the nutrient being cycled in the diagram. **1**

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(ii) Outline the role of soil nutrient cycles in agriculture. **2**

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Question 21 continues on page 15

Question 21 (continued)

(b) Describe the importance of invertebrates in both decomposition and nutrient cycling. **3**

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End of Question 21

Please turn over

Question 22 (8 marks)

(a) Outline TWO influences of government on production and marketing of agricultural products. **3**

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(b) Justify marketing options that could be used for a named farm product. **5**

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Question 23 (12 marks)

Answer parts (a)–(c) with reference to a product you have studied.

Name of product: .....

(a) Why is a named market specification important for this product? **2**

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(b) Explain how scheduling the timing of ONE named operation in a production cycle contributes to meeting a named market specification for this product. **4**

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Question 23 continues on page 18

Question 23 (continued)

(c) Justify ONE management strategy, other than timing of operations, that can be used to meet a named market specification. **6**

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End of Question 23

Question 24 (6 marks)

Answer Question 24 with reference to a product you have studied.

Name of product: .....

Assess the effectiveness of an advertising or promotional campaign for this product. **6**

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Question 25 (12 marks)

(a) Describe the purpose of standardisation and randomisation in the design of an experiment. **4**

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(b) A student has been asked to design an experiment to investigate the effect of plant density on plant growth and/or yield. **4**

Describe how the student could include standardisation and randomisation in the experimental design.

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Question 25 continues on page 21

Question 25 (continued)

(c) Explain why farmers control weeds to manage sources of plant competition. **4**

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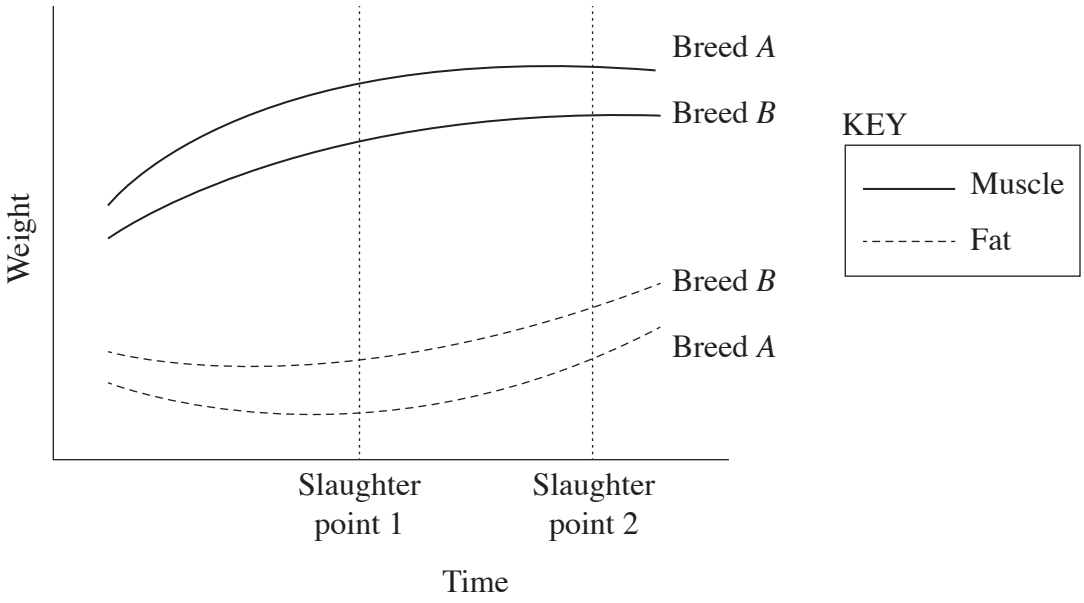
End of Question 25

Please turn over

Question 26 (8 marks)

(a) The graph depicts the relative changes in muscle and fat of two different breeds of the same animal species. **4**



For a particular market for this animal, consumers require a lean, highly muscled carcase.

Justify a farmer's choice of breed and slaughter point to meet these consumer requirements.

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Question 26 continues on page 23

Question 26 (continued)

(b) Discuss the use of hormone growth promotants (HGPs) in the manipulation of an animal's growth and development. **4**

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End of Question 26

Question 27 (8 marks)

Explain TWO management techniques that manipulate reproduction in farm animals and are directly dependent on the interaction of hormones in an animal's oestrus cycle. **8**

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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

Please turn over

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

(a) (i) Outline reasons for the labelling of foods containing genetically modified organisms (GMOs). **3**

(ii) Describe the regulations that are associated with the development and use of GMOs in Australian agriculture. **5**

(b) Discuss TWO uses of biotechnology in agriculture. Support your answer with relevant examples. **12**

OR

Question 29 — Climate Challenge (20 marks)

(a) (i) Outline the sources of the THREE greenhouse gases from agricultural systems. **3**

(ii) Describe methods which can be used in agricultural systems to reduce the concentration of greenhouse gas in the atmosphere. **5**

(b) Discuss TWO management options a farmer could use to manage climate variability in their production enterprise. Support your answer with relevant examples. **12**

OR

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

(a) (i) Outline issues relating to the funding of research and development of agricultural technologies. **3**

(ii) Describe methods that can be used to market a new technological development to farmers. **5**

(b) Discuss TWO uses of new agricultural technology. Support your answer with relevant examples. **12**

End of paper