BOARD OF STUDIES
NEW SOUTH WALES

2011

HIGHER SCHOOL CERTIFICATE EXAMINATION

Agriculture

General Instructions

- Reading time – 5 minutes
- Working time – 3 hours
- Write using black or blue pen
  Black pen is preferred
- Draw diagrams using pencil
- Board-approved calculators may be used
- Write your Centre Number and Student Number at the top of pages 9, 11, 13, 17, 19 and 21

Total marks – 100

Section I Pages 2–22

80 marks

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 21–28
- Allow about 1 hour and 45 minutes for this part

Section II Pages 23–24

20 marks

- Attempt ONE question from Questions 29–31
- 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 is a direct product of photosynthesis?

(A) Starch

(B) Glucose

(C) Glycogen

(D) Carbon dioxide

2 What group of chemicals is responsible for the regulation of animal reproductive systems?

(A) Enzymes

(B) Hormones

(C) Promotants

(D) Regulators

3 The fate of energy in the diet of an animal can be shown as follows:

Gross Energy $\rightarrow$ *X* Energy $\rightarrow$ Metabolisable Energy $\rightarrow$ *Y* Energy

What are the types of energy at *X* and *Y* respectively?

	X	*Y*
(A)	Net	Total
(B)	Total	Digestible
(C)	Digestible	Net
(D)	Digestible	Total

4 Which of the following is most useful to farmers when analysing the financial situation of a farm?

(A) Gross margin

(B) Supply trends

(C) Gross production

(D) Whole-farm planning

5 What does net assimilation rate (NAR) measure?

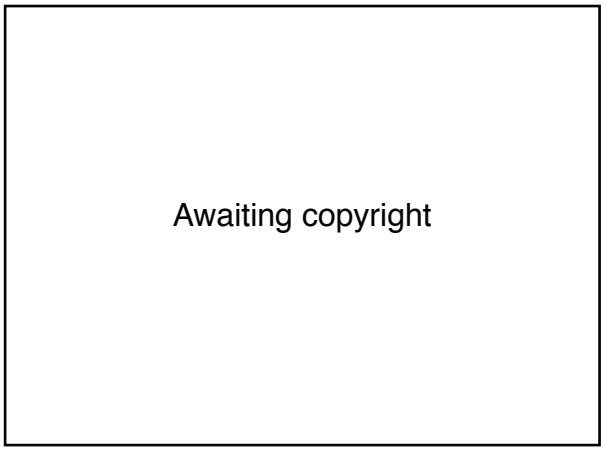
(A) Photosynthesis

(B) Cellular respiration

(C) Nutrient uptake of a plant

(D) Dry matter production of a plant

6 The diagram shows the early stages of the growth of a plant.



To which group does this plant belong?

(A) Grasses

(B) Dicotyledons

(C) Monogastrics

(D) Monocotyledons

7 The growth rate (kg/day) for each animal in a pen of steers is shown.

2.7	2.1	1.7	2.0	1.8	2.5	2.5	1.7	2.0

What is the mean growth rate for the pen of steers?

(A) 1.90 kg/day

(B) 2.00 kg/day

(C) 2.11 kg/day

(D) 2.38 kg/day

8 What name is given to the spherical swellings on the roots of a legume?

(A) Nodules

(B) Rhizomes

(C) Root hairs

(D) Guard cells

9 Which of the following statements correctly relates a chemical characteristic of soil to an effect that increases plant growth?

(A) Soil particles with a net positive charge attract cations.

(B) A low bulk density value raises the porosity of the soil.

(C) Extreme pH values make all plant nutrients more available.

(D) Soil particles with a high cation exchange capacity release large numbers of cations.

10 Which type of plant hormone increases the ripening rate of fruits?

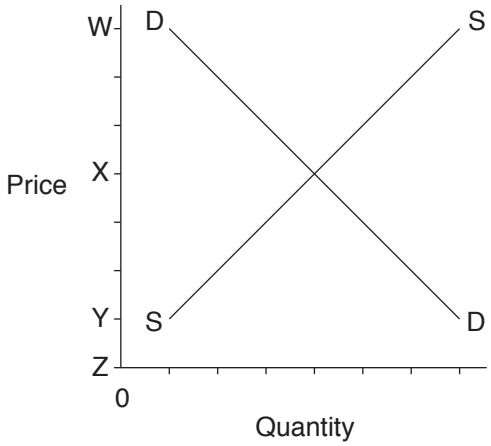
(A) Auxin

(B) Cytokinin

(C) Ethylene

(D) Gibberellin

11 The graph shows the supply (S) and consumer demand (D) curves for a farm product.



Which letter corresponds to the price at which both the producer and consumer would be satisfied (equilibrium market price)?

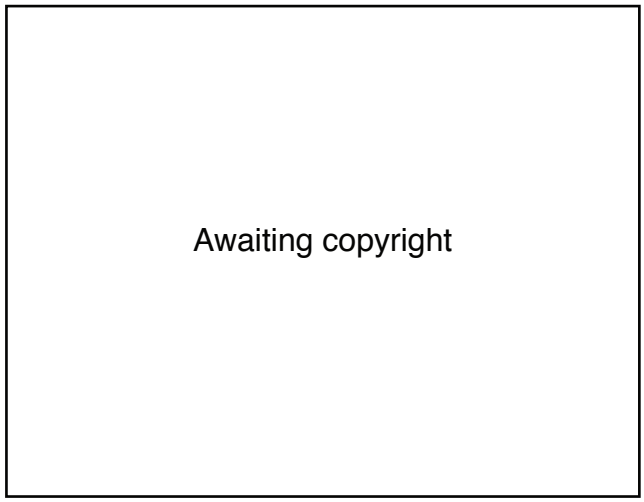
(A) W

(B) X

(C) Y

(D) Z

12 A procedure used in cattle production is shown in the diagram.



What reproductive technique uses this procedure?

(A) Embryo transfer

(B) Pregnancy testing

(C) Artificial insemination

(D) Oestrus synchronisation

13 A government charge on the amount of irrigation water used will have an effect on

(A) farm safety.

(B) interest rates on farm loans.

(C) the marketing of farm products.

(D) the production of plants and animals.

14 What name is given to the marketing strategy where one owner is involved in different parts of the supply chain for a product?

(A) Contract selling

(B) Saleyard selling

(C) Vertical integration

(D) Wholesale marketing

15 Which of the following is an example of a behavioural characteristic of an animal?

(A) Fertility

(B) Liveweight

(C) Temperament

(D) Body temperature

16 The label for a pesticide that can be used to treat cattle lice is shown.

DIRECTIONS FOR USE

DOSE RATE FOR CATTLE: 5 mL per 100 kg liveweight

Critical Comments:

- Dose rate to be based on the heaviest cattle in the herd
- Apply to whole herd

A farmer has a herd of 26 bulls, with weights ranging from 800–900 kilograms. Half of the herd is infected with cattle lice.

How much pesticide needs to be administered to treat this herd of bulls?

(A) 390 mL

(B) 585 mL

(C) 780 mL

(D) 1170 mL

17 A farmer is planning the lambing season for a flock of ewes. The average gestation period for sheep is 147 days.

If the first lambs are to be born at the end of July, the rams need to be joined with ewes that are cycling no later than the beginning of

(A) January.

(B) February.

(C) March.

(D) April.

18 A farmer aims to sell lambs at a minimum average liveweight of 50 kg. The lambs were born at the end of July with an average birthweight of 3.6 kg. The lambs' average daily weight gain is 0.4 kg per day.

The earliest the farmer is able to sell the lambs is the end of

(A) October.

(B) November.

(C) December.

(D) January.

19 Which of the following describes ONLY physical characteristics of a soil?

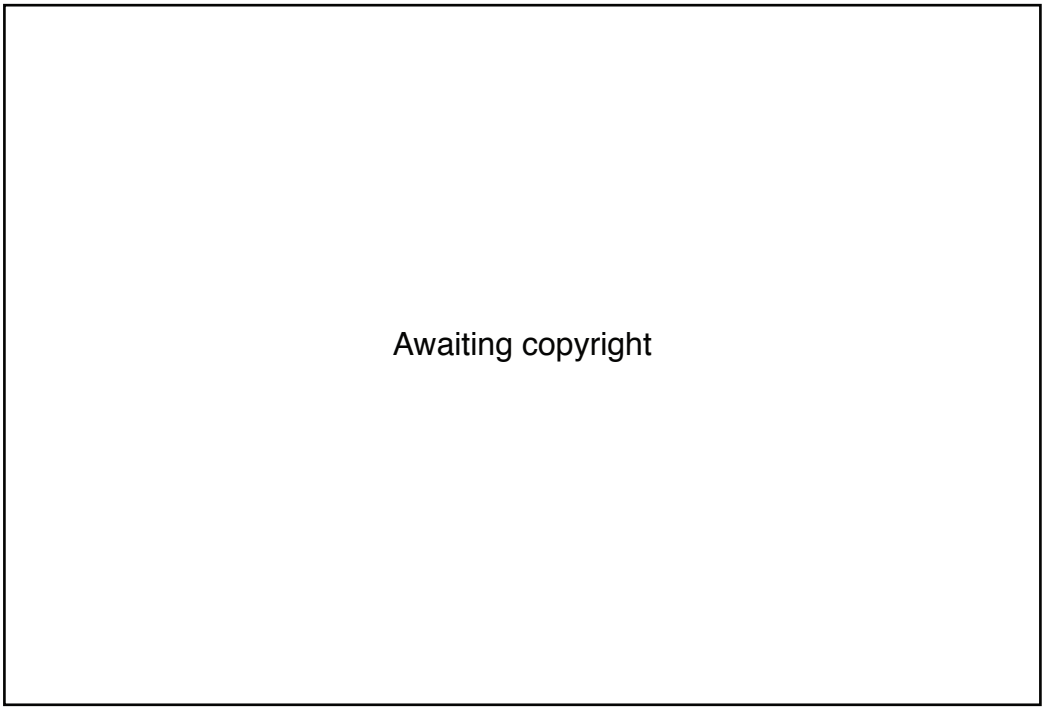
(A) Porosity, structure, texture

(B) Porosity, structure, nitrogen status

(C) Ion exchange capacity, structure, texture

(D) Ion exchange capacity, carbon status, nitrogen status

20 The blood hormone levels found in a female farm animal at each stage of the oestrus cycle are shown in the graph.



Which hormone corresponds to which line on the graph?

	W	X	Y	Z
(A)	Progesterone	Follicle stimulating hormone	Oestrogen	Luteinising hormone
(B)	Progesterone	Luteinising hormone	Oestrogen	Follicle stimulating hormone
(C)	Oestrogen	Luteinising hormone	Follicle stimulating hormone	Progesterone
(D)	Oestrogen	Follicle stimulating hormone	Luteinising hormone	Progesterone

Centre Number

Student Number

Section I (continued)

Part B – 60 marks
Attempt Questions 21–28
Allow about 1 hour and 45 minutes for this part

Answer the questions in the spaces provided. These spaces provide guidance for the expected length of response.

Question 21 (9 marks)

Name ONE farm product you have studied.

Name of farm product .....

(a) Describe a specification that this farm product must meet for a particular market. **2**

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Question 21 continues on page 10

(b) Illustrate a marketing chain for this farm product that includes TWO marketing options for the product. **3**

(c) Assess an advertising or promotional campaign for this farm product. **4**

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End of Question 21

Centre Number

Student Number

Section I – Part B (continued)

Question 22 (9 marks)

(a) Explain how interest rate trends over time can affect decision making for a farm. **3**

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Question 22 continues on page 12

(b) Analyse the structure of the Australian agribusiness sector, including a comparison of the importance of the family farm with other components of this sector. **6**

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End of Question 22

Centre Number

Student Number

Section I – Part B (continued)

Question 23 (4 marks)

How might the implementation of Australian land capability classification affect the profitability and sustainability of agricultural systems? **4**

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Question 24 (7 marks)

A researcher conducted a field experiment to determine the effects of planting density on the yield of cauliflowers.

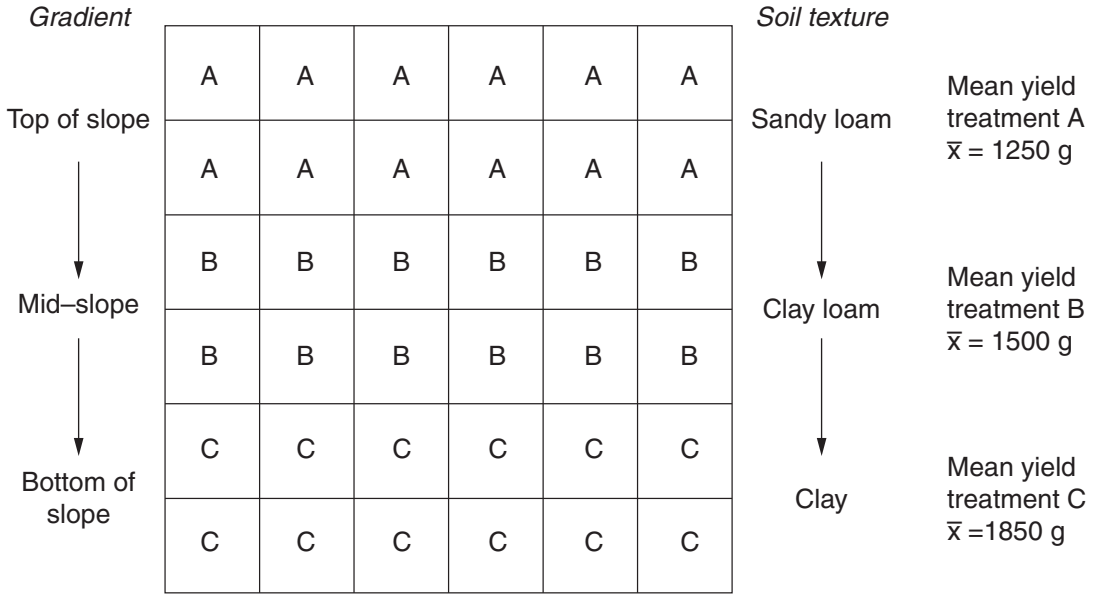
Three planting densities were used:

Treatment A – 20 cm spacing between plants

Treatment B – 50 cm spacing between plants

Treatment C – 80 cm spacing between plants

The researcher prepared 36 trial plots of equal size. Mean yields (grams/cauliflower) for each of the treatments and the position of each plot are shown. The soil texture trend and gradient of the field are also shown.



(a) Which treatment in this experiment is most likely to produce the greatest number of cauliflowers? **1**

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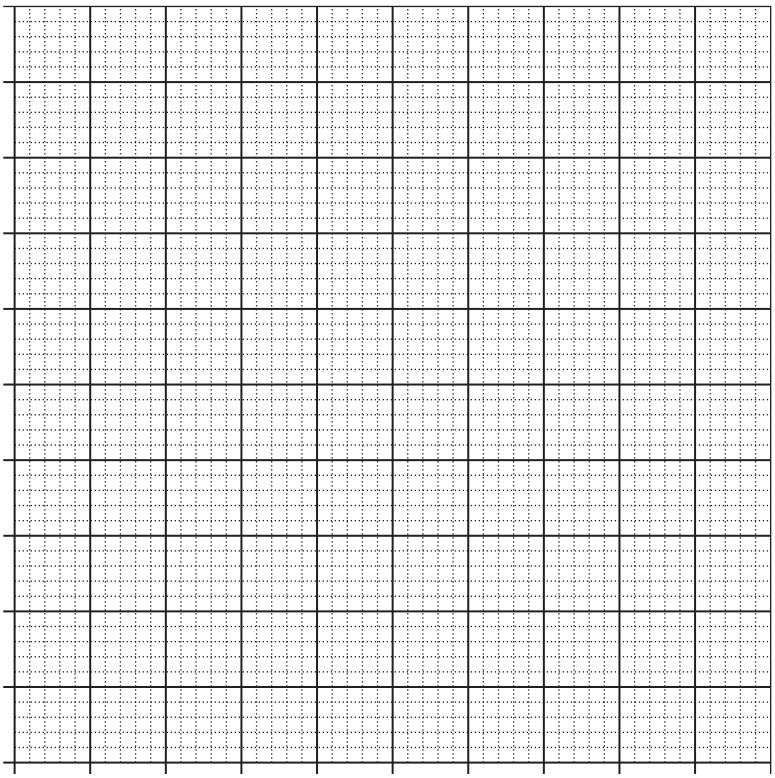
Question 24 continues on page 15

(b) Construct a graph that represents the mean yields of the THREE treatments in this experiment. **3**



(c) Explain how an alternative experimental design for this experiment may improve the validity of the results. **3**

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End of Question 24

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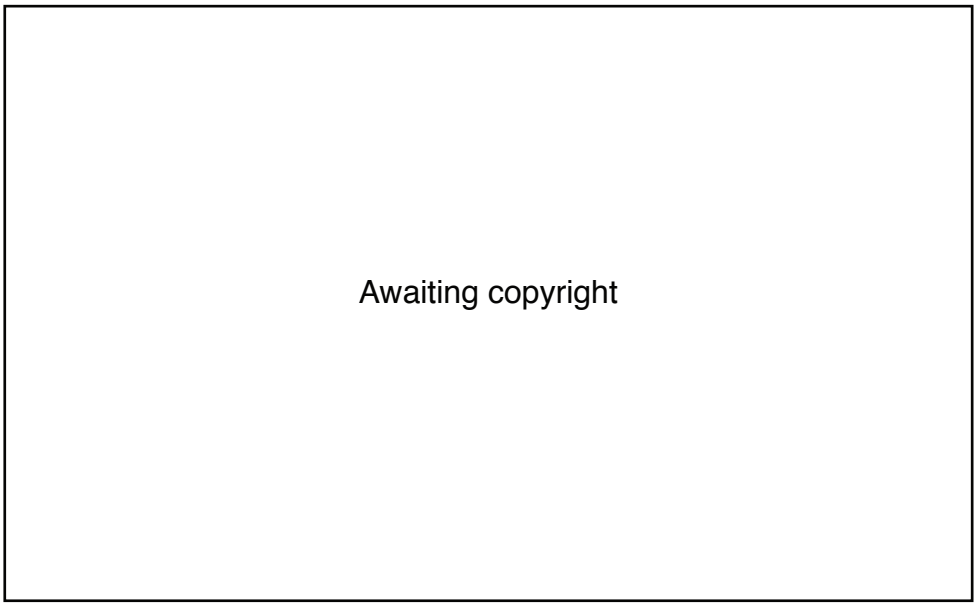
Question 25 (7 marks)

Digested 'biosolid' (the solid residue produced from effluent) is being applied as a fertiliser as an alternative to inorganic fertilisers.

A study was carried out to investigate the effects of biosolid fertiliser on the growth and grain yield of maize. The level of vegetative yield (t/ha) and grain yield (t/ha) are shown.



(a) Explain why the grain yield from the application of inorganic fertiliser differed from that of the control. **3**

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Question 25 continues on page 18

Question 25 (continued)

(b) Explain why a maize producer may decide NOT to use biosolid fertiliser. **4**

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End of Question 25

Centre Number

Section I – Part B (continued)

Student Number

Question 26 (7 marks)

(a) Why do pigs produce less methane than cattle or sheep? **3**

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(b) Explain, using an example, how an animal's feed can be adjusted to meet changing energy and protein requirements. **4**

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Question 27 (7 marks)

Evaluate an Integrated Pest Management (IPM) program for a named pest or disease of an animal host you have studied. In your answer, include examples of management strategies used in this program. **7**

Centre Number

Student Number

Section I – Part B (continued)

Question 28 (10 marks)

(a) Explain a strategy that farmers use to manage the sustainability of water resources for agricultural production. **3**

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Question 28 continues on page 22

(b) For a soil degradation problem, explain farm management practices that have contributed to the problem and a procedure that can be used to alleviate the problem. **7**

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End of Question 28

Agriculture

Section II

20 marks
Attempt ONE question from Questions 29–31
Allow about 45 minutes for this section

Answer part (a) of the question in a writing booklet. Answer part (b) of the question in a SEPARATE writing booklet. Extra writing booklets are available.

In your answers you 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 29 — Agri-food, Fibre and Fuel Technologies (20 marks)

Answer part (a) of the question in a writing booklet.

(a) (i) Identify TWO ways of producing biofuel from agricultural crops. **2**

(ii) Evaluate biofuel production with respect to the sustainable and efficient use of carbon. **6**

Answer part (b) of the question in a SEPARATE writing booklet.

(b) Analyse a research study of the development or implementation of ONE agricultural biotechnology. **12**

OR

Please turn over

In your answers you 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 30 — Climate Challenge (20 marks)

Answer part (a) of the question in a writing booklet.

(a) (i) Outline the basis of the Southern Oscillation Index (SOI). **2**

(ii) Describe the process causing the climate events of La Niña and El Niño. **6**

Answer part (b) of the question in a SEPARATE writing booklet.

(b) Evaluate management options available to farmers to manage the effects of climate variability on plant or animal production. **12**

OR

Question 31 — Farming in the 21st Century (20 marks)

Answer part (a) of the question in a writing booklet.

(a) (i) Why is research needed when developing agricultural technologies? **4**

(ii) Propose reasons why a newly developed agricultural technology may NOT be widely adopted. **4**

Answer part (b) of the question in a SEPARATE writing booklet.

(b) Discuss, using examples, the benefits of recent developments in computer related technologies that are used to monitor and manage factors associated with agricultural production. **12**

End of paper