BOARD OF STUDIES
NEW SOUTH WALES

STUDENT NUMBER

CENTRE NUMBER

HIGHER SCHOOL CERTIFICATE EXAMINATION

1996

AGRICULTURE

2/3 UNIT (COMMON)

SECTION I

(20 Marks)

Total time allowed for Sections I, II, III, and IV—Three hours
(Plus 5 minutes' reading time)

DIRECTIONS TO CANDIDATES

- Write your Student Number and Centre Number at the top right-hand corner of this page.
- Board-approved calculators may be used.

Section I

- Attempt ALL questions.
- Answer the questions in the spaces provided in this paper.

EXAMINER'S USE ONLY

Page	Marks
2	
3	
5	
6	

EXAMINER'S USE ONLY

SECTION I

(20 Marks)

Attempt ALL questions.

Allow about 35 minutes for this Section.

QUESTION 1

Name ONE farm product you have studied.

Name of farm product .....

Answer ALL parts in Question 1 about the product.

(a) (i) In the space provided, *draw* and *label* a model or flowchart to show the marketing chain, including feedback, involved in getting the farm product to the consumer.

(ii) List TWO service industries involved in the post-production processing and handling of the farm product.

1. .....

2. .....

QUESTION 1. (Continued)

EXAMINER'S USE ONLY

(iii) Describe ONE strategy or technique employed by these service industries to ensure that a high quality product arrives at the consumer.

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(iv) Outline how government legislation and policy affects the marketing chain.

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(b) (i) Describe how the farm manager can add value to the farm product before it leaves the farm gate.

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(ii) List THREE sources of information used by the farm manager when making decisions about the *on-farm* production of the farm product.

1. .....

2. .....

3. .....

EXAMINER'S USE ONLY

QUESTION 2

Figures 1 and 2 show a farm landscape in 1985 and the same farm in 1995.

FIG. 1. THE FARM IN 1985

FIG. 2. THE FARM IN 1995

QUESTION 2. (Continued)

EXAMINER'S USE ONLY

In 1985 a farm family purchased a severely degraded property that they wanted to improve. The drawings on page 4 show the farm in 1985, and in 1995 after ten years of an improvement program.

(a) For ONE of the problems shown in Figure 1, describe TWO possible causes of the problem on the farm.

Problem .....

(i) .....

.....

(ii) .....

.....

(b) From Figure 2, name TWO practices that have been adopted by the family to improve sustainability.

(i) .....

(ii) .....

(c) For ONE of these practices, describe the way it contributes to sustainability of the farm.

Practice .....

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.....

.....

(d) Outline the possible tension between long-term sustainability and short-term profitability that may have been considered by the family when devising the improvement program.

.....

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.....

(e) Name an off-farm source of assistance that the family may have used to carry out the improvements.

.....

EXAMINER'S USE ONLY

QUESTION 3

During a ten-week feeding trial, five cows were fed a supplement designed to increase milk production and milk protein. These five cows were compared with five control cows over the same period. The average daily results for each cow are given in Table 1.

TABLE 1. COW FEEDING EXPERIMENT

	CONTROL		ADDED SUPPLEMENT	
	Average production (litres/cow)	*Average protein* (%)	*Average production* (litres/cow)	*Average protein* (%)
	20	3·1	21	3·5
	19	3·2	19	3·8
	26	3·4	20	3·8
	17	3·2	22	3·5
	20	3·1	21	3·6
Mean	20·4		20·6	3·6
Standard deviation	3·4	0·12	1·1	0·15

(a) Calculate the mean protein percentage for the control group.

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(b) What information about this experiment is provided by the standard deviations?

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(c) What recommendations about the use of the supplement could you make to a farmer, on the basis of these results? Give your reasons.

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(d) State ONE change in experimental design that might be made to obtain more reliable results when repeating this experiment. Give your reasons.

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1996

AGRICULTURE

2/3 UNIT (COMMON)

SECTION II

(45 Marks)

Total time allowed for Sections I, II, III, and IV—Three hours
(Plus 5 minutes' reading time)

DIRECTIONS TO CANDIDATES

- Write your Student Number and Centre Number at the top right-hand corner of this page.
- Board-approved calculators may be used.

Section II

- Attempt THREE questions.
- Answer the questions in the spaces provided in this paper.
- Place a tick in the boxes on this page to indicate the questions you have attempted in Section II.

Question	Question Attempted	Examiner's Use Only
4		
5		
6		
7		

EXAMINER'S USE ONLY

SECTION II

(45 Marks)

Attempt THREE questions.

Each question is worth 15 marks.

Allow about 80 minutes for this Section.

QUESTION 4

(a) Table 2 shows the effect of paddock history on brown leaf spot disease of lupins and lupin yield in 1991. Brown leaf spot causes lupins to lose leaves.

TABLE 2. PADDOCK HISTORY EFFECT ON DISEASE AND YIELD IN LUPINS

	Paddock history			Leaves lost to brown spot (%)	Lupin grain yield (t/ha)
Paddock	*1988*	*1989*	*1990*	*1991*	
A	Wheat	Canola	Wheat	16%	1·35
B	Lupins	Wheat	Wheat	16%	1·30
C	Canola	Lupins	Wheat	60%	0·60
D	Wheat	Lupins	Lupins	90%	0·12

(i) Which paddock history has caused the greatest disease?

.....

(ii) 1. What recommendation could you give growers in the district about the length of time between lupin crops?

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2. Give your reason for this recommendation.

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(iii) Lupins are a legume. What benefit might they have in rotation for subsequent crops?

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QUESTION 4. (Continued)

EXAMINER'S USE ONLY

(b)

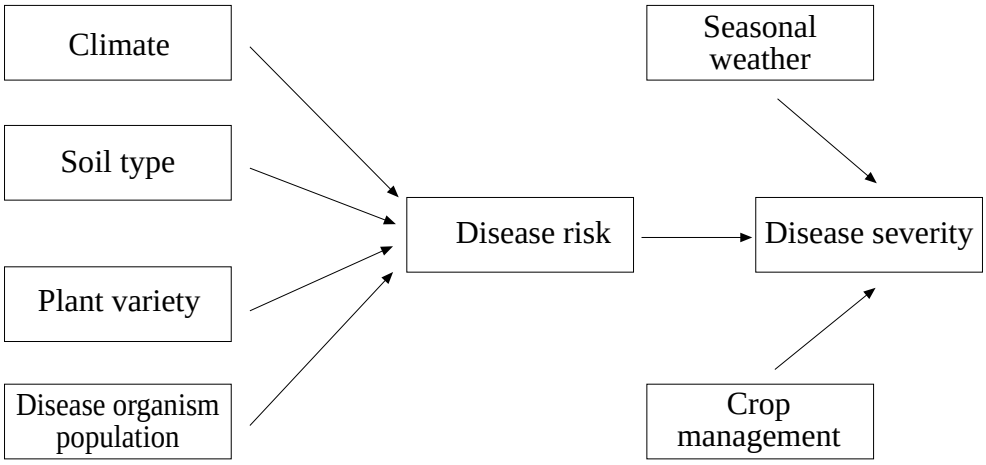

FIG. 1. FACTORS INFLUENCING LEAF DISEASES

(i) Describe the way that the following could increase or decrease disease risk. Use an example in each case.

1. Disease organism population.

.....

.....

2. Plant variety.

.....

.....

(ii) Outline the relationship between disease risk and disease severity shown in Figure 1.

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(iii) For a crop that you have studied, outline how *seasonal weather* could increase or decrease disease severity in a season.

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Question 4 continues on page 12

QUESTION 4. (Continued)

EXAMINER'S USE ONLY

(c) Name TWO practices that farm managers should employ when using chemicals.

Explain how each practice ensures the safety of the wider community.

(i) Practice .....

Explanation .....

.....

(ii) Practice .....

Explanation .....

.....

(d) Lupin crop residues are commonly grazed by sheep after harvest. Data from farm observations show that crop residues of some varieties of lupin may cause symptoms of poisoning in grazing sheep.

TABLE 3. EFFECT OF LUPIN RESIDUES ON SHEEP

Variety of lupin crop residue	*Total sheep showing symptoms*	*Total sheep grazing*
Old varieties	2 860	68 700
Modern varieties	110	72 360

(i) Calculate the percentage of sheep affected by the old varieties of lupins.

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(ii) Describe a plant breeding system that could have been used by plant geneticists to develop the less toxic varieties of lupins.

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(e) Outline animal welfare issues that should be considered when conducting experiments using farm animals.

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QUESTION 5

EXAMINER'S USE ONLY

(a)

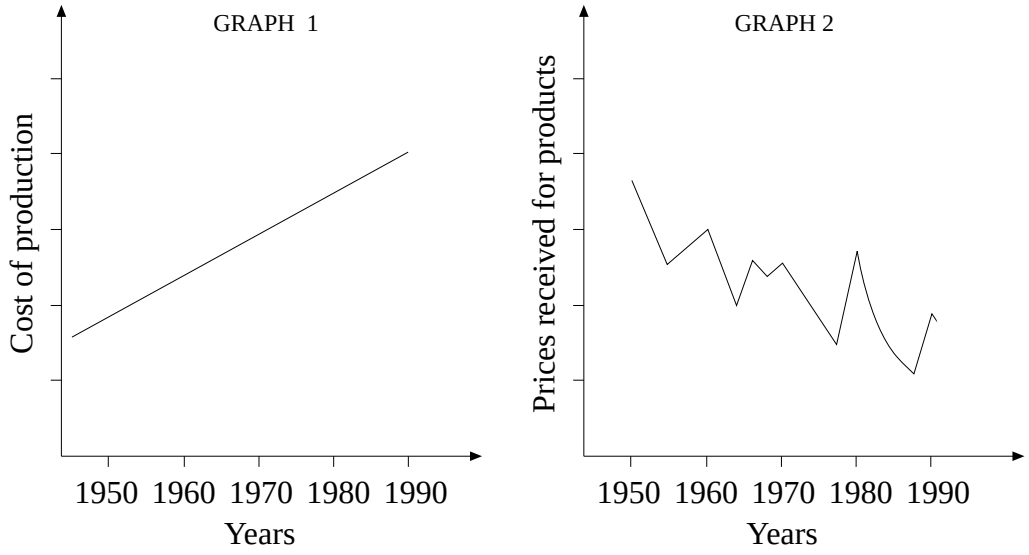

FIG. 2. TRENDS IN FARM COSTS AND PRICES

(i) Describe the trends shown in Graphs 1 and 2.

.....

.....

(ii) Suggest TWO causes for the irregular shape of Graph 2.

1. .....

.....

2. .....

.....

(iii) Describe strategies farmers can implement that could reduce problems associated with costs and prices.

1. Costs .....

.....

.....

2. Prices .....

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QUESTION 5. (Continued)

EXAMINER'S USE ONLY

(iv) Describe the social and economic implications of the trends in Graphs 1 and 2 for rural communities.

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(b) Name an animal product that you have studied.

Name of product .....

(i) Outline the market specifications that are used to identify the quality of this product.

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(ii) Outline management strategies that a farmer can use to achieve the quality required in ONE of the specifications in part (b) (i) above.

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(c) One way to increase profitability is to increase total production. Another approach is to produce quality-specified products for a premium market. Describe factors a farmer may consider when deciding which of these approaches to adopt.

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Question 5 continues on page 16

QUESTION 5. (Continued)

EXAMINER'S USE ONLY

(d) Name a farm product and outline the relationship between the timing of production cycles and marketing opportunities.

Name of product .....

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QUESTION 6

EXAMINER'S USE ONLY

(a) Scientists measured the soil pH under a subclover pasture for over seventy years. The results are shown in Figure 3.

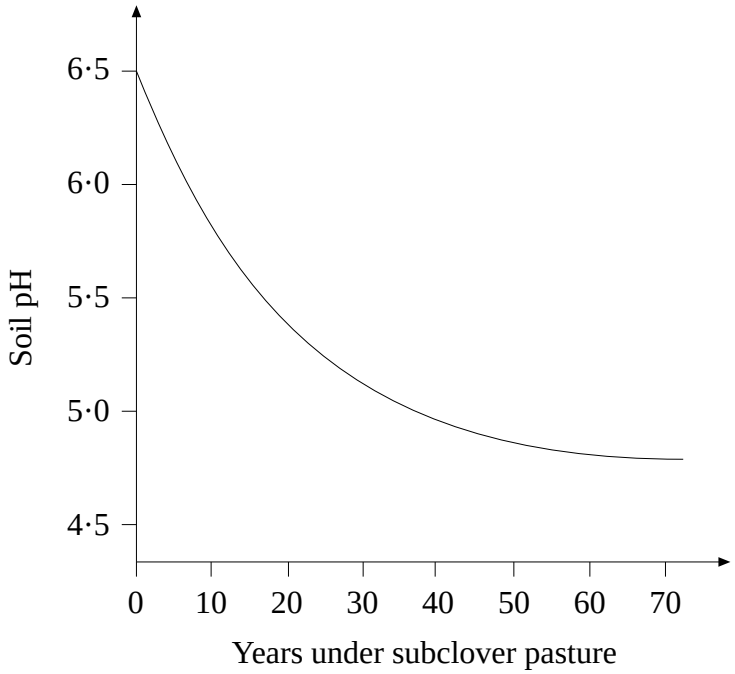

FIG. 3. SOIL pH VS YEARS UNDER SUBCLOVER PASTURE

(i) Describe the trend shown in Figure 3.

.....

.....

(ii) State THREE effects of low soil pH on plants.

1. .....

2. .....

3. .....

(iii) Outline TWO management techniques that a farmer could use to overcome the effects of low pH in the pasture.

1. .....

.....

2. .....

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Question 6 continues on page 18

QUESTION 6. (Continued)

EXAMINER'S USE ONLY

(b) The data in Table 4 were collected from sheep flocks in three years. They show the effect of drench programs on worm resistance.

TABLE 4. PERCENTAGE OF FLOCKS WITH WORMS RESISTANT TO TWO DRENCHES

	% flocks with worm resistance		
Drench combination	*1987*	*1990*	*1993*
Drench *A* only	80	94	98
Drench *B* only	64	87	85
Drench *A* and *B* alternately	0	10	15

(i) What conclusions can you draw about drench usage and worm resistance?

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(ii) Outline the reasons for development of resistance in worms.

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(c) Outline management strategies that would increase the effectiveness of a chemical pest control program.

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(d) Describe the effects on the wider ecosystem of the over-use of fertilisers.

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QUESTION 6. (Continued)

EXAMINER'S USE ONLY

(e) Describe TWO management techniques that a farmer can use to improve the physical characteristics of the soil.

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(f) Outline the benefits of soil microbes and invertebrates to soil fertility.

(i) Microbes .....

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(ii) Invertebrates .....

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EXAMINER'S USE ONLY

QUESTION 7

(a) Grazing ewes may need supplementary feeding during pregnancy. Table 5 shows the recommended levels of supplementary oats needed per day by pregnant ewes grazing on high and low quality pasture during early and late pregnancy.

TABLE 5. OATS REQUIRED FOR A PREGNANT EWE

	PREGNANT EWE CARRYING SINGLE		PREGNANT EWE CARRYING TWINS	
Type of pasture	*Early pregnancy*	*Late pregnancy*	*Early pregnancy*	*Late pregnancy*
Low quality pasture	200 g	500 g	250 g	1000 g
High quality pasture	0 g	300 g	200 g	800 g

(a) (i) What conclusions can you draw from the data in Table 5?

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(ii) Calculate the total amount of oats needed per day to feed 200 ewes in late pregnancy when grazing on low quality pasture. Assume fifty per cent of ewes are carrying twins.

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(b) Why is a high plane of nutrition important to pregnant farm animals?

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QUESTION 7. (Continued)

EXAMINER'S USE ONLY

(c) Figure 4 shows water-table depths recorded at two locations over twenty years.

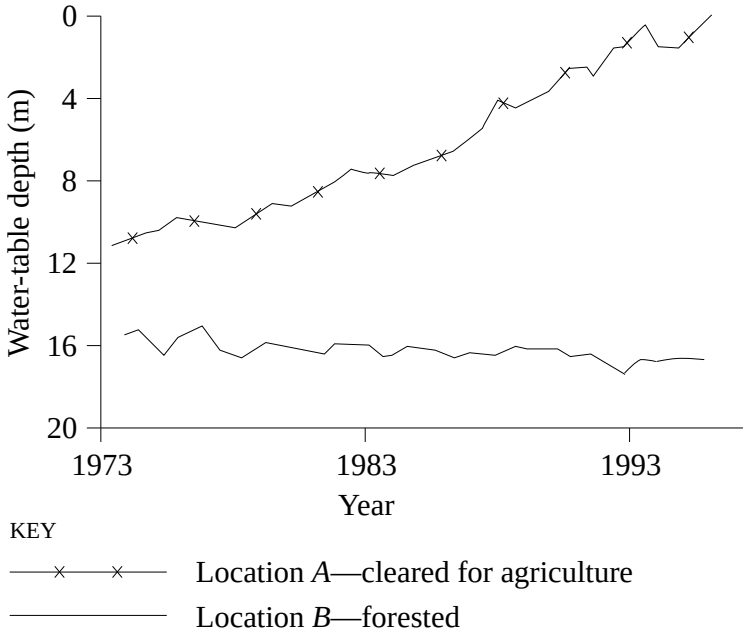

FIG. 4. WATER-TABLE DEPTH IN TWO LOCATIONS

(i) Describe the trends shown in Figure 4 at locations *A* and *B*.

.....

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(ii) Explain why these different trends are occurring.

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(iii) What agricultural problems are likely to occur as a result of the changes at location *A*?

.....

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(iv) What practices might a farmer at location *A* have to carry out to reverse the existing trend?

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Question 7 continues on page 22

QUESTION 7. (Continued)

EXAMINER'S USE ONLY

(d) (i) Explain the meaning of a pesticide label that reads 'Withholding Period: Do not apply later than 14 days before sale'.

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(ii) Outline personal safety precautions that should be used when handling chemical insecticides.

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(e) Describe the role of gross margin analysis in farm decision making.

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(f) A growing monogastric animal requires a protein level of 20%, while a growing ruminant requires 12%. Explain the reasons for the difference.

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HIGHER SCHOOL CERTIFICATE EXAMINATION

1996

AGRICULTURE

2/3 UNIT (COMMON)

SECTION III

(20 Marks)

SECTION IV

(15 Marks)

Total time allowed for Sections I, II, III, and IV—Three hours
(Plus 5 minutes' reading time)

DIRECTIONS TO CANDIDATES

- Write your Student Number and Centre Number at the top right-hand corner of this page.
- Board-approved calculators may be used.

Section III

- Attempt ONE question.
- Answer the question in the spaces provided in this paper.
- Place a tick in the box on this page to indicate the question you have attempted in Section III.

Section IV

- Attempt ONE question.
- Answer the question in a *separate* Writing Booklet.
- You may ask for additional Writing Booklets if you need them.

Question	Question Attempted	Examiner's Use Only
8		
9		
10		

EXAMINER'S USE ONLY

SECTION III

(20 Marks)

Attempt ONE question.

Each question is worth 20 marks.

Allow about 35 minutes for this Section.

QUESTION 8. Plant Production

(a) (i) Many techniques in plant production allow farm managers to manipulate plant growth and development.

Briefly describe ONE such technique that you have used on a named plant species.

Plant species .....

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.....

.....

(ii) State TWO reasons for using this technique.

1. .....

2. .....

(iii) Describe the criteria that could be used to evaluate the effectiveness of the technique.

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QUESTION 8. (Continued)

EXAMINER'S USE ONLY

(b) Figure 5 is a diagrammatic representation of a cross-section of a plant root.

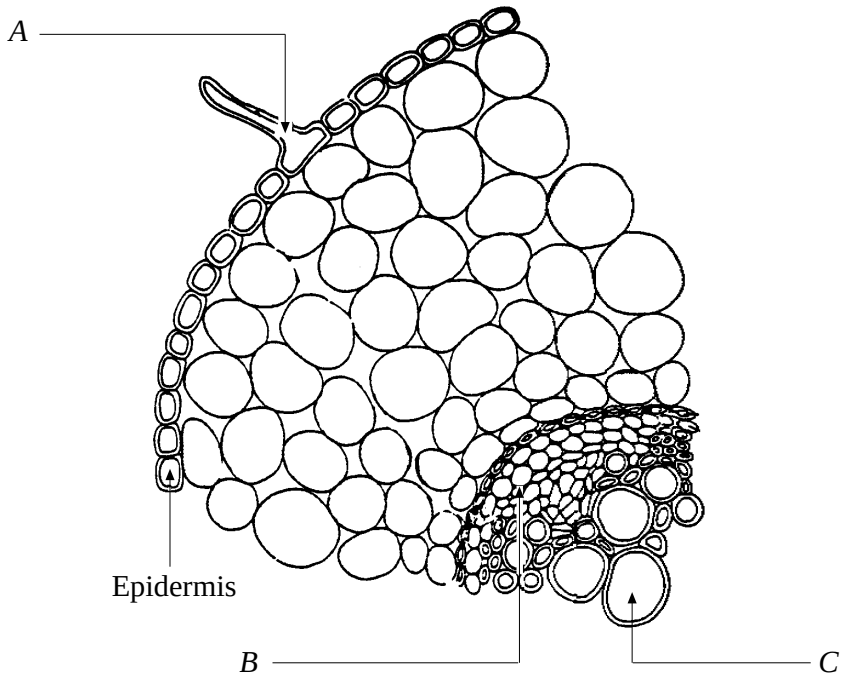

FIG. 5. CROSS-SECTION OF A PLANT ROOT

(i) Label parts *A*, *B*, and *C* on the diagram above.

(ii) Describe the process of uptake of nutrients from the soil into the plant root.

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(c) Explain how soil and water management practices are used to manipulate plant growth.

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Question 8 continues on page 28

QUESTION 8. (Continued)

EXAMINER'S USE ONLY

(d) Plant variety rights is an important issue to the future of plant production in Australia. Explain what is meant by the term plant variety rights. State your view on this issue, using examples to support your opinion.

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EXAMINER'S USE ONLY

QUESTION 9. Animal Production

(a) Table 6 shows the energy value of feeds for pigs and cattle.

TABLE 6. FEED ENERGY VALUES

Animal	*Feed*	*Gross energy* (MJ/kg)	*Metabolisable energy* (MJ/kg)
Pig	Maize	18·4	16·9
	Wheat	19·4	13·3
Cattle	Maize	18·4	14·0
	Wheat	19·4	12·3

(i) 1. An animal nutritionist requires a high energy feed for a pig ration. Which feed would you select?

.....

2. State your reason.

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(ii) Maize, when fed to pigs and cattle, has different metabolisable energy values. Explain why this is the case.

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Question 9 continues on page 30

QUESTION 9. (Continued)

EXAMINER'S USE ONLY

(b) (i) What is the advantage of increasing ovulation rates in animal-production systems?

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(ii) Describe TWO techniques or management strategies that could be used to increase ovulation rates. Use examples from animals you have studied.

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(c) Rumen micro-organisms are essential to the health of ruminant animals.

(i) Name the TWO main types of micro-organisms in the rumen.

1. .....

2. .....

(ii) Describe the role of these micro-organisms in the synthesis of amino acids.

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(d) Briefly describe how breeding has been used to improve the quality of a characteristic specified by the market. Use an example from an animal industry you have studied.

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QUESTION 9. (Continued)

EXAMINER'S USE ONLY

(e) In many farm animals the young are vaccinated soon after birth.

Describe the immune response following vaccination.

Discuss other management procedures designed to prevent disease.

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QUESTION 10. Land Management

EXAMINER'S USE ONLY

(a) Environmental awareness within the community is increasing, and land degradation is now being recognised as a major environmental and economic problem in Australia.

Describe the causes of the following THREE types of land degradation:

(i) erosion;

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(ii) irrigation salinity;

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(iii) soil structural decline.

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QUESTION 10. (Continued)

EXAMINER'S USE ONLY

(b) The Landcare program involves many people from different sections of the community, such as government departments, community organisations, and local groups.

(i) Name TWO different departments, organisations, or groups that are involved in Landcare programs.

1. .....

2. .....

(ii) Briefly outline the role of ONE association named in part (b) (i) in the Landcare program.

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.....

(iii) Briefly outline ONE type of work that has been carried out by Landcare groups in your area and describe the impact it has had.

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(iv) Assess the importance to the wider community of fostering an ethic of caring for the land.

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Question 10 continues on page 34

QUESTION 10. (Continued)

EXAMINER'S USE ONLY

(c) Systems of land capability assessment have been developed for Australian agriculture. Explain what is meant by land capability assessment and explain how it can be used to enhance sustainable land use on farms.

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SECTION IV

(15 Marks)

Marks

Attempt ONE question.

Each question is worth 15 marks.

Allow about 30 minutes for this Section.

QUESTION 11

'The future of productive and profitable agriculture lies in sustainable farming practices. These practices rely on an understanding of the complex interactions between agricultural subsystems.'

(a) Describe the implications of the above statements in relation to ONE animal OR plant production system that you have studied. **6**

(b) Discuss the economic, social, and environmental pressures that contribute to the implementation of these practices by farm managers. **9**

QUESTION 12

There are a number of techniques that may increase rates of reproduction and/or the rate of spread of superior genotypes of livestock.

(a) Describe THREE such techniques used in animal production systems. **6**

(b) Discuss the role of objective measurements in determining the effectiveness of such techniques. **4**

(c) Evaluate the impact of the THREE techniques on the rate of improvement of animal production systems. **5**

QUESTION 13

The physical and chemical properties of a soil largely determine the ways in which it can be used. Using examples of soils that you have studied, illustrate the above statement. In your answer, you should:

(a) describe the physical and chemical properties of the soils; **6**

(b) discuss the farming practices that enhance or reduce the physical and chemical qualities of these soils. **9**

QUESTION 14 **Marks**

The nitrogen cycle is important in agricultural systems.

Farmers attempt to manipulate some of the processes within the nitrogen cycle.

(a) Describe the nitrogen cycle using a diagram. **4**

(b) Explain the processes of nitrogen fixation and mineralisation. **5**

(c) Describe techniques used by farmers to manipulate the processes of fixation and mineralisation. **6**