2001 HSC Specimen Paper

Agriculture
ACKNOWLEDGEMENTS

Question 2 (e) – Australian Commodity Prices relative to 1980, Reprinted by kind permission ABARE

Question 4 (b) – Plant Tissue Culture Practice, Taji Dodd and Williams 2nd ed.
University of New England 1993

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Agriculture

Introduction
This booklet contains the specimen examination paper for the 2001 Higher School Certificate examination in Agriculture. A mapping grid is also included, showing how each question in the examination relates to the syllabus outcomes and content, and to the performance bands.

The specimen paper shows the format of the New HSC examination. It has been printed on A4 paper and side-stapled to make it convenient for use in schools. Actual examination papers will be produced as A4 booklets. All New HSC papers will be printed on white paper.

The 2001 HSC specimen papers have been produced in accordance with the Board’s Principles for Setting HSC Examinations in a Standards-Referenced Framework, published in Board Bulletin Volume 8 Number 9 (Nov/Dec 99). Questions are closely related to the outcomes of the course, and the paper as a whole is structured to allow for appropriate differentiation of student performance at all levels on the performance scale.

The papers have been designed so that students have a clear understanding of what they are required to do in each question and in working through the paper. Instructions have been standardised, and the demands of the questions have been made explicit. Key words in questions, such as ‘discuss’, ‘analyse’, and ‘explain’, have been used consistently in accordance with the glossary published in the Board’s Assessment Support Document.

This specimen paper is an example of the type of examination that could be prepared within the examination specifications in the Agriculture syllabus. Examinations will be based on the syllabus, and will test a representative sample of syllabus outcomes. Therefore, the range and balance of outcomes tested in HSC examinations in 2001 and subsequent years may differ from those addressed in the specimen paper.

The mapping grid is an important feature of the development of the examination. It aids in ensuring that the examination as a whole samples a range of content and outcomes, and allows all students the opportunity to demonstrate their level of achievement. Where courses have components in the examination other than written papers, the grid indicates the wider range of outcomes that are assessed by including these other components.

There are a number of points to note in considering the Agriculture specimen paper:

- The Agriculture examination consists of two papers – Paper 1 and Paper 2. All students must sit for Paper 1, while students who have chosen to study two electives (rather than complete a research project) must sit for Paper 2.
- The number of parts to the questions has been kept to a minimum. The questions now require more integrated answers, giving students the opportunity to show higher-order thinking skills.
• In Section II, the number of parts in the questions and the marks allocated may vary from year to year.
• In Section III and Paper 2, where students have a choice of questions, the questions all have a similar structure to aid in ensuring comparability across these questions. However, in subsequent examinations, the style and structure of the questions may differ from those in the specimen paper.
For each item in the examination, the grid shows the marks allocated, the syllabus content and syllabus outcomes it relates to, and the bands on the performance scale it is targeting. The range of bands shown indicates the performance candidates may be able to demonstrate in their responses. That is, if an item is shown as targeting Bands 3 – 5, it indicates that candidates who demonstrate performance equivalent to the Band 3 descriptions should be able to score some marks on the item, while those who perform at Band 5 or above could reasonably be expected to gain high marks. In the case of one-mark items, candidates who demonstrate performance at or above the bands shown generally could be expected to answer the item correctly.

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<th>Targeted performance bands</th>
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**Paper 2**

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**Research Project**

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<th>Syllabus outcomes</th>
<th>Targeted performance bands</th>
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<td>Report – research question, acknowledgements, synopsis or abstract, literature review, research methodology, results, data analysis, conclusion, recommendations, references</td>
<td>H3.4, H4.1, H5.1</td>
<td>2 – 6</td>
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<tr>
<td></td>
<td>Process Journal</td>
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</table>
Sample marking guidelines for Agriculture

The following marking guidelines have been developed for selected questions from the 2001 HSC Specimen Examination in Agriculture. These guidelines indicate the approach that would be taken to marking questions.

For each question, the following are typically included:
1. The syllabus outcomes that are targeted by the question.
2. The assessment rubric from the specimen paper, where there is one, listing the set of general criteria that are used to assess responses.
3. The marking guidelines, which show the criteria to be applied to responses along with the marks to be awarded in line with the quality of the responses. For extended-response questions, performance is described at a number of levels of performance, each covering a range of marks.
4. A sample answer or some points that answers might include. Sample answers indicate the scope and depth of treatment expected, and are not intended to be prescriptive. Similarly, the points that could be included in answers are not intended to be an exhaustive list, but rather an indication of the considerations that students could include in their responses.

Marking guidelines will generally require some refinement at the Marking Centre to take account of unanticipated responses that students present. For essay-type questions, the standard described at each mark range will be made clear during pilot-marking by the selection of sample scripts.

In a standards-referenced framework, examination questions are closely linked to syllabus content and outcomes. Expectations of the question are to be clear in the wording of the question. Marking guidelines will be developed at the same time as the examination questions, by examination committees. The development of marking guidelines will be guided by the Board’s Principles for Developing Marking Guidelines Examinations in a Standards-Referenced Framework, published in Board Bulletin Volume 9 Number 3 (May 2000).
Sample Marking Guidelines – Agriculture

Question 1 (10 marks)

Name ONE farm product you have studied. Answer ALL parts of Question 1 about the product named.

(a) Identify ONE criterion for assessing the quality of the product. 1

*Outcome assessed: H3.1*

**MARKING GUIDELINES**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>States one quality criterion for the product</td>
<td>1</td>
</tr>
</tbody>
</table>

Sample answer:
Farm product: Milk
Hygienic quality of fresh milk is tested using the Bulk Milk Cell Count.

(b) Describe TWO actions a farmer may take to maximise the quality of the product before it leaves the farm. 2

*Outcomes assessed: H3.1, H3.2*

**MARKING GUIDELINES**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Marks</th>
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</thead>
<tbody>
<tr>
<td>Describes two viable on-farm actions that maximise the quality of the named product</td>
<td>2</td>
</tr>
<tr>
<td>Describes one possible on-farm action that could maximise the quality of the named product</td>
<td>1</td>
</tr>
</tbody>
</table>

Answers could include:
Farm product: Milk
- Washing of cows’ udders;
- Teat dipping;
- Thorough flushing and cleaning of dairy equipment and tanks;
- Refrigeration of on-farm milk vats at 4°C.

(c) Explain how agencies or organisations may contribute to the marketing of the product. 2

*Outcomes assessed: H3.1, H3.2*

**MARKING GUIDELINES**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explains the contribution of agencies or organisations to the marketing of the named product through specific examples of their contributions</td>
<td>2</td>
</tr>
<tr>
<td>Explains the contribution of agencies or organisations to the marketing of the named product by using general terms only</td>
<td>1</td>
</tr>
</tbody>
</table>
Sample answer:
Farm product: Milk
NSW Dairy Corporation has delegated to Milk Marketing (NSW) responsibility for the promotion of liquid milk products in NSW. Milk Marketing aims to increase milk consumption and awareness through marketing campaigns such as ‘Milk. Legendary stuff’.

(d) Assess the impact of scientific research on the production process.  

_outcomes assessed: H3.1, H3.2_

**MARKING GUIDELINES**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Describes research or states a specific example of scientific research that has had an impact on the production process of the named product</td>
<td>4 – 5</td>
</tr>
<tr>
<td>• Forms valid conclusions about the impact of the research on the production process</td>
<td></td>
</tr>
<tr>
<td>• States an example of scientific research that has had an impact on the production process of the named product</td>
<td>2 – 3</td>
</tr>
<tr>
<td>• Draws a simple conclusion about the value of the research to the production process</td>
<td></td>
</tr>
<tr>
<td>• States an example of scientific research that has had an impact on the production process of the named product</td>
<td>1</td>
</tr>
</tbody>
</table>

Sample answer:
Farm product: Milk
Research into the effect of feeding concentrates and grains as a supplement to pastures for dairy cows has had a positive impact on the quality and quantity of milk. Not only has the proportion of farmers feeding concentrates or grain increased but the quantities used have risen markedly to 54 t and 82 t per farm respectively. As a result, average milk production per cow has risen in the past decade from 4000 L to 4300 L per year.

Question 6 (15 marks)

(a) Describe important aspects of chemical usage that need to be considered to provide safeguards to the farm environment.  

_outcome assessed: H1.1_

**MARKING GUIDELINES**

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<tr>
<th>Criteria</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Describes, using a range of examples, several aspects of the safe use of chemicals on farms</td>
<td>5 – 6</td>
</tr>
<tr>
<td>• Discusses how these aspects safeguard the farm environment</td>
<td></td>
</tr>
<tr>
<td>• Describes in brief, using a few examples, several aspects of the safe use of chemicals on farms</td>
<td>3 – 4</td>
</tr>
<tr>
<td>• Discusses safeguards to the farming environment in general terms</td>
<td></td>
</tr>
</tbody>
</table>
Answers could include:

Examples of the safe use of chemicals:
- Protective clothing and equipment protects the handler
- Application only when conditions are suitable, such as low wind to avoid contamination of waterways etc by spray drift
- Labelling secure storage and safe disposal of containers to avoid possible contamination of the soil, water table or waterways via spillage or corrosion
- Following directions on label, such as rates of dilution and application rates to ensure that contamination is avoided and chemical resistance is reduced

(b) Evaluate the farm management practices that have been adopted by farmers to incorporate safe chemical usage.

Outcomes assessed: H1.1, H3.4

MARKING GUIDELINES

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Marks</th>
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<tbody>
<tr>
<td>Describes one aspect of the safe use of chemicals on farms</td>
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<td>Describes, using examples, several relevant farm management practices</td>
<td>8 – 9</td>
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<td>Describes two to three relevant farm management practices</td>
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<tr>
<td>Identifies two to three relevant farm management practices</td>
<td>4 – 5</td>
</tr>
<tr>
<td>Identifies one relevant farm management practice</td>
<td>2 – 3</td>
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</tbody>
</table>

Answers could include:

Examples of farm management practices and their impacts:
- Crop rotation – breaks life-cycle of many insect pests and reduces need for chemical sprays and thereby limits the potential harm to the wider community
- Crop selection – certain crops are less susceptible to insect and disease attack by using these genetically modified varieties, eg cotton variety ‘ingenaur’ which requires less chemical sprays, the insects do not build up resistance so quickly
- Tilling as an alternative form of weed control to herbicides – reduces need for chemical spraying but this can have a negative impact in that it can cause soil structural problems
- Keeping grazing animals from recently sprayed pastures – cattle should be kept off pastures/feed sprayed with endosulphines to avoid contamination
Sample marking guidelines for the Optional Research Project in Agriculture

The following sample marking guidelines have been developed for the Optional Research Project component of the HSC Examination in Agriculture. In conjunction with the previously published sample marking guidelines for selected questions from the 2001 HSC Specimen Examination paper, they indicate the approach that would be taken to marking student responses for the entire examination.

For these component(s) of the examination, the following are included:
1. A description of the task, derived from the syllabus
2. The syllabus outcomes that are assessed by the task
3. The criteria, derived from the outcomes, that are used to assess the task
4. The marking guidelines for each component of the task

The marking guidelines describe the full range of performance typically demonstrated by students. Descriptions are given for ranges of marks, representing performances at different levels of achievement. In marking a response, the marker initially assigns it to one of these levels, and the judgement is then refined to decide on the mark to be awarded. Markers use a variety of strategies, including sample responses, to assist them in this process.

For the HSC examinations in 2001 and beyond, marking guidelines for all parts of the examination will be developed by the examination committee. The development of marking guidelines will be guided by the Board’s Principles for Developing Marking Guidelines in a Standards-Referenced Framework, published in Board Bulletin Volume 9 Number 3 (May 2000).

These marking guidelines need to be read in conjunction with the syllabus and the syllabus errata published in Board Bulletin Vol 9 No 8, November 2000. The syllabus errata indicate
• the report components
• the assessment criteria
• that the process journal will not be marked or contribute to the report mark.
HSC examination overview

The HSC examination in Agriculture consists of two parts. Paper 1, worth 70 marks, is a written paper for all candidates, that examines the core of the course. Candidates who have studied electives in the course sit Paper 2, worth 30 marks. Those candidates who have done the optional research project instead of studying electives submit a research project, worth 30 marks.

Task: Optional Research Project (30 marks)

The research project enables students to study a particular agricultural issue or problem. The scope of the issue or problem open to students includes those that arise from production, the economic environment, marketing and the social environment. There is a wide range of research methodologies that can be used and the most appropriate one must be applied to investigating and exploring the particular issue or perspective chosen.

The material submitted by students for the research project consists of a report and process journal. The report communicates the research methodology, data analysis and evaluation of the research project. It must consist of at least 3000, and no more than 5000, words. The text must be supplemented by additional appropriate material such as graphs, figures, tables, slides and photographs. The process journal details the student’s progress throughout the research project, and is verified by the student’s teacher. The process journal will not be marked or contribute to the report mark. It may be used for verification that the candidate has carried out the research identified in the formal report.

It is essential that students are aware of the legal requirements and ethical considerations involved in the aim, design and methodology of their research projects. Ethical considerations and legal requirements relate to animal welfare, the use of chemicals and occupational health and safety. It is expected that students be aware of specific laws, regulations and codes of practice that may affect the conduct of their projects.

The research project, certified both by the principal and the student to be the original work of the student, must be submitted to the Board of Studies. The Board will notify schools of the date for submission. Forms for certification will be provided by the Examinations and Certification Branch of the Board of Studies.

The research project must be identifiable only by the candidate number and centre number. Photographs must not reveal the identity of the student or school. Acknowledgements must not reveal teachers, NSW Agriculture officers, cooperating farmers or other students by name or specific locality. Where students have worked cooperatively with other students on a collaborative experiment, the nature and extent of such collaboration is to be identified by the student number.

To satisfy certification requirements, each student must submit an individual research project based on the student’s original, individual investigation. Students may seek assistance in the investigation (for example sources such as NSW Agriculture for statistical analysis or experimental design). They may collaborate (for example where the student has been responsible for a number of plots in a large-scale trial, but uses material from the whole trial) but they must acknowledge such assistance and all sources of information. The work presented in the project must have been undertaken
by the student and the results must be based on the student’s own investigation. The investigation may be based on previously published work. Teacher comments on a project are NOT to be submitted but may be requested in exceptional circumstances, for example loss and damage.

Assessment of the project will be based on the extent to which the research project fulfils the outcomes and content specified in the syllabus.

The balance between various segments of the report may alter, depending on the specific nature of the research project undertaken and the resources available to the student.

The report must include:
- a research question
- synopsis or abstract
- literature review
- research methodology
- results
- data analysis
- conclusions
- ethical and welfare issues
- recommendations
- referencing and acknowledgements

Students may commence the practical component of their research project at any time after the beginning of Term 2 of the school year preceding their HSC year, provided that the student’s report (analysis and writing up of material) is substantially completed in the HSC course.

Assessment criteria
- Presentation of a cohesive, well-reasoned and detailed report on an appropriate independent investigation
- Inclusion of appropriate supporting material, such as graphs, figures, tables, slides and photographs
- Identification of an appropriate research question in an agricultural situation
- Provision of an accurate synopsis or abstract of the investigation
- Evidence of a comprehensive literature review
- Application of appropriate research methodology and technologies
- Presentation of results, appropriate data analysis and drawing of accurate and relevant conclusions from this investigation
- Identification and evaluation of ethical and welfare issues relevant to this research and the wider field of agricultural research
- Presentation of detailed and appropriate recommendations drawn from this research and supported by the data and/or research
- Inclusion of accurate referencing and acknowledgements
Outcomes assessed: H3.4, H4.1, H5.1

### MARKING GUIDELINES

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Presents a cohesive, well-reasoned and detailed research report, supplemented by a variety of appropriate additional material, such as graphs, figures, tables, slides and photographs</td>
<td>25 – 30</td>
</tr>
<tr>
<td>• Provides an accurate synopsis or abstract and a comprehensive and relevant literature review of a range of different types of literature</td>
<td></td>
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<tr>
<td>• Selects and applies appropriate technologies and extensive research methods for this investigation, collects and presents all relevant data in an appropriate way, thoroughly and correctly analyses the data and draws accurate and relevant conclusions</td>
<td></td>
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<tr>
<td>• Identifies and evaluates a range of ethical and welfare issues relevant to the design of this research and the wider field of agricultural research</td>
<td></td>
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<tr>
<td>• Makes a comprehensive, detailed and appropriate set of recommendations drawn from this research and supported by the data and/or research</td>
<td></td>
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<tr>
<td>• Includes accurate referencing and suitable acknowledgements</td>
<td></td>
</tr>
<tr>
<td>• Presents a cohesive and well-reasoned research report that is supplemented by appropriate additional material, such as graphs, figures, tables, slides and photographs</td>
<td>19 – 24</td>
</tr>
<tr>
<td>• Provides an accurate synopsis or abstract and a relevant literature review of different sources</td>
<td></td>
</tr>
<tr>
<td>• Selects and applies appropriate technologies and research methods for this investigation, collects and presents most relevant data in an appropriate way, correctly analyses this data and draws accurate and relevant conclusions</td>
<td></td>
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<tr>
<td>• Identifies and discusses a range of ethical and welfare issues relevant to the design of this research and the wider field of agricultural research</td>
<td></td>
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<tr>
<td>• Makes several appropriate recommendations drawn from this research and supported by the data and/or research</td>
<td></td>
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<tr>
<td>• Includes accurate referencing and a set of acknowledgements</td>
<td></td>
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<tr>
<td>• Presents a sound research report, supplemented by appropriate additional material, such as graphs, figures, tables, slides and photographs</td>
<td>13 – 18</td>
</tr>
<tr>
<td>• Provides an incomplete synopsis or abstract and a limited literature review</td>
<td></td>
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<tr>
<td>• Selects and applies most appropriate technologies and steps in the research methods for this investigation, collects and presents some relevant data in an appropriate way, correctly analyses this data and draws accurate and relevant conclusions</td>
<td></td>
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<tr>
<td>• Identifies and describes some ethical and welfare issues relevant to the design of this research and the wider field of agricultural research</td>
<td></td>
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<tr>
<td>• Makes few appropriate recommendations drawn from this research and supported by the data and/or research</td>
<td></td>
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<tr>
<td>• Includes incomplete referencing and several acknowledgements</td>
<td></td>
</tr>
<tr>
<td>Criteria</td>
<td>Marks</td>
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<tr>
<td>-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------</td>
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<tr>
<td>• Presents a basic research report, supplemented by some additional appropriate material, such as graphs, figures, tables, slides and photographs&lt;br&gt;• Provides a limited synopsis or abstract and a limited literature review&lt;br&gt;• Selects and applies several appropriate steps in the research methods and technologies for this investigation, collects and presents some relevant data, attempts to analyse this data and draw conclusions&lt;br&gt;• Identifies some ethical and welfare issues relevant to the design of this research and the wider field of agricultural research&lt;br&gt;• Makes recommendations that may not be appropriate or supported by the data and/or research&lt;br&gt;• Includes references and acknowledgements that may be incomplete or inaccurate</td>
<td>7 – 12</td>
</tr>
<tr>
<td>• Presents a limited research report, supplemented by few, or inappropriate, additional materials&lt;br&gt;• Provides a basic literature review&lt;br&gt;• Selects and applies several steps in the research methods and technologies for this investigation, collects and presents some data with inappropriate analysis&lt;br&gt;• Identifies one or two ethical and welfare issues relevant to the design of this research and the wider field of agricultural research&lt;br&gt;• Includes references and acknowledgements that are inadequate</td>
<td>1 – 6</td>
</tr>
</tbody>
</table>
Agriculture
Paper 1

General Instructions

• Reading time – 5 minutes
• Working time – 2 hours
• Write using blue or black pen
• Board-approved calculators may be used
• Write your Centre Number and Student Number at the top of this page and page 9

Section I  Pages 2 – 7
Total marks (25)
• Attempt Questions 1 – 3
• Allow about 40 minutes for this section

Section II  Pages 9 – 14
Total marks (30)
• Attempt Questions 4 – 5
• Allow about 50 minutes for this section

Section III  Page 15
Total marks (15)
• Attempt ONE question from Questions 6 – 9
• Allow about 30 minutes for this section
Section I

Total marks (25)
Attempt Questions 1 – 3
Allow about 40 minutes for this section

Answer the questions in the spaces provided.

Question 1 (10 marks)

Name ONE farm product you have studied.

Name of farm product .................................................................

Answer ALL parts of Question 1 about the product named.

(a) Identify ONE criterion for assessing the quality of the product. 1

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(b) Describe TWO actions a farmer may take to maximise the quality of the product before it leaves the farm. 2

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Question 1 continues on page 3
(c) Explain how agencies or organisations may contribute to the marketing of the product.

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(d) Assess the impact of scientific research on the production process.

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End of Question 1
Question 2 (10 marks)

(a) How does acidification affect soil quality?
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(b) Describe TWO farming practices that accelerate the soil acidification process.
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(c) Describe TWO strategies that a farmer may adopt to neutralise the acidity in a soil.
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(d) Explain how the strategy of crop rotation benefits cropping systems.
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Question 2 continues on page 5
(e) The graph shows Australian commodity prices for three groups (wool, beef and wheat) relative to 1980.

What is the main trend over time for prices received by farmers in all three commodity groups? Describe TWO possible effects on farming practices if this trend continues.

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End of Question 2
Question 3 (5 marks)

A crop was growing poorly. Soil tests were taken from the paddock and these, combined with observation of plant symptoms, suggested that growth was limited by either sulfur or potassium, or a combination of both nutrients. Soil samples were collected from the site and a glasshouse pot trial was set up with five replications of the following treatments:

- control
- potassium fertiliser (50 kg K/ha)
- sulfur fertiliser (40 kg S/ha)

The results given in Table 1 show dry matter yields (grams/pot) when the plants were cut after eight weeks’ growth.

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Rep. 1</th>
<th>Rep. 2</th>
<th>Rep. 3</th>
<th>Rep. 4</th>
<th>Rep. 5</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>1.8</td>
<td>2.5</td>
<td>2.0</td>
<td>2.2</td>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>Potassium</td>
<td>2.3</td>
<td>2.7</td>
<td>2.0</td>
<td>2.1</td>
<td>2.4</td>
<td>2.3</td>
</tr>
<tr>
<td>Sulfur</td>
<td>6.2</td>
<td>5.7</td>
<td>5.3</td>
<td>6.5</td>
<td>6.3</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Table 1: Dry matter yield (g/pot)

(a) Which nutrient was the main limitation to growth? ................................................................. 1
(b) Outline an additional treatment that should have been included to improve the glasshouse experiment. .................................................................................................................................................... 2

Question 3 continues on page 7
(c) Describe further experimental work that would need to be done before making field recommendations about fertiliser rates.

End of Question 3

Please turn over
Section II

Total marks (30)
Attempt Questions 4 – 5
Allow about 50 minutes for this section

Answer the questions in the spaces provided.

Question 4 (15 marks)

(a) What was the effect of ONE Aboriginal land management practice on Australian ecosystems prior to European settlement?

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Question 4 continues on page 10
(b) Figure 2 is a diagrammatic representation of a transverse section of a leaf.

Identify TWO of the labelled structures in Figure 2, and describe the role of each structure in essential plant processes.

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(c) Describe the impact of ONE environmental factor, other than temperature, on the germination stage of the plant life cycle.

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Question 4 continues on page 11
Question 4 (continued)

(d) Identify a soil organism that may benefit plant production and explain how this organism can improve plant production.

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(e) (i) Why might scientists and farmers consider using the genetic material of native plant species in plant production systems?

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(ii) Why must scientists and farmers exercise care when working with genetic material from different species?

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End of Question 4
Question 5 (15 marks)  

(a) Identify a significant characteristic in a breeding system for an animal production system you have studied, and describe an objective measurement used to monitor that characteristic.

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(b) Explain how market specifications have changed a characteristic in a breeding program for a plant OR animal production system you have studied.

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Question 5 continues on page 13
Question 5 (continued)

(c) Why do ruminant animals have a less efficient feed conversion ratio than monogastric animals?

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(d) Explain the role of hormones in regulating animal reproduction. In your answer, refer to specific examples.

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Question 5 continues on page 14

Marks

(c) 3

(d) 4
Question 5 (continued)

(e) Table 2 shows the energy value of feeds for pigs and cattle.

<table>
<thead>
<tr>
<th>Animal</th>
<th>Feed</th>
<th>Gross energy (MJ/kg)</th>
<th>Metabolisable energy (MJ/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig</td>
<td>Maize</td>
<td>18.4</td>
<td>16.9</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>19.4</td>
<td>13.3</td>
</tr>
<tr>
<td>Cattle</td>
<td>Maize</td>
<td>18.4</td>
<td>14.0</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>19.4</td>
<td>12.3</td>
</tr>
</tbody>
</table>

Table 2: Feed Energy Values

(i) An animal nutritionist requires a high energy feed for a pig ration. Which feed would you select? Give a reason for your selection.
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(ii) Why does maize have different metabolisable energy values when fed to pigs and cattle?
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End of Question 5
Section III

Total marks (15)
Attempt ONE question from Questions 6 – 9
Allow about 30 minutes for this section

Answer the question in a writing booklet. Extra writing booklets are available.

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**Question 6 (15 marks)**

(a) Describe important aspects of chemical usage that need to be considered to provide safeguards to the farm environment.  
(b) Evaluate the farm management practices that have been adopted by farmers to incorporate safe chemical usage.

OR

**Question 7 (15 marks)**

(a) Describe the major features of a sustainable agricultural system.  
(b) Evaluate the effectiveness of new technologies and management strategies that have been developed to maintain and enhance the sustainability of agricultural systems.

OR

**Question 8 (15 marks)**

(a) How does product quality contribute to the profitability of agricultural production systems?  
(b) Critically assess the decisions made by farm managers regarding product quality in an animal or plant production system that you have studied.

OR

**Question 9 (15 marks)**

(a) Outline the marketing chain from producer to consumer for a particular product that you have studied.  
(b) Critically assess the marketing strategies adopted by farmers and farming organisations to address changed consumer preferences and/or needs.

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End of paper
Agriculture
Paper 2

General Instructions
- Paper 2 should only be attempted by students who have studied Electives
- Reading time – 5 minutes
- Working time – 1 hour
- Write using blue or black pen
- Board-approved calculators may be used

Total marks (30)
- Attempt TWO questions from Questions 1 – 6
- Allow about 30 minutes for each question
Total marks (30)
Attempt TWO questions from Questions 1 – 6
Allow about 30 minutes for each question

Answer each question in a SEPARATE writing booklet. Extra writing booklets are available.

Question 1 — Agribusiness (15 marks)

(a) Describe the choices available to a farm business to obtain finance for its operations. 3

(b) Describe ONE way in which data were collected by the researcher in the study that you analysed in this elective. Justify ONE other appropriate way in which data could be collected for this study. 4

(c) Evaluate the impact of international markets on farm businesses. 8

Question 2 — Animal Management (15 marks)

(a) Outline a technique commonly used by farmers to manipulate an animal’s growth rate. 3

(b) Describe ONE ethical issue considered by the researcher in the design and methodology adopted in the study that you analysed in this elective. Why is it important for agricultural researchers to follow a code of practice? 4

(c) Evaluate the impact of changes being made to animal breeding systems and techniques on reproductive efficiency. 8

Question 3 — Horticulture (15 marks)

(a) Using examples from the industry that you have studied, describe how plant physiology influences productivity. 3

(b) Describe ONE way in which data were analysed by the researcher in the study that you analysed in this elective. Justify ONE other appropriate way in which data could be analysed for this study. 4

(c) Assess the influence of changing markets, both domestic and international, on products, production techniques and post-harvest handling in horticulture. 8
### Question 4 — Innovation and Diversification (15 marks)

(a) Describe how environmental factors have influenced the development of an alternative agricultural production system or technology.  

(b) How was the research question identified in the study that you analysed in this elective? Why is it important to clearly identify a research question?  

(c) Evaluate the impact of marketing trends on the development and implementation of alternative agricultural systems and enterprises.

### Question 5 — Plant Management (15 marks)

(a) Explain how plant density may affect the vegetative and reproductive yields of plants.  

(b) Describe ONE experimental technique used by the researcher in the study that you analysed in this elective. Justify ONE other experimental technique that could be used in this study.  

(c) Evaluate a current technology or technique used to improve the productivity of a plant production system you have studied.

### Question 6 — Sustainable Land and Resource Management (15 marks)

(a) Using an example from your local area, describe how a land capability assessment may lead to sustainable land use.  

(b) Describe ONE finding made by the researcher in the study that you analysed in this elective. Explain how this finding could lead to further research in sustainable land and resource management.  

(c) Evaluate the impact of current water management strategies in assisting with the conservation and efficient use of water.

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End of paper