

2016 VCE Agricultural and Horticultural Studies examination report

General comments

The 2016 Agricultural and Horticultural Studies examination assessed Units 3 and 4 of the study design. Students showed an adequate understanding of the modification of climate and soils. Areas that require further improvement included monitoring, prevention and control of weeds, pests and diseases – in particular, understanding of the integrated weed or pest/disease management approach. Various forms of land degradation, their causes, prevention and control also need greater understanding.

When answering questions related to agricultural or horticultural businesses, students need to understand that they are not being asked about their chosen business project that they have undertaken throughout the year. Students need to gain a greater understanding of methods of marketing, using ICT applications to monitor the business, cash flows and value-adding.

A number of responses showed that students did not understand the context of a question. Visits to farms or horticultural facilities to experience a real context with regard to business marketing, value-adding, pest and or weed control, biosecurity, etc., may be beneficial to students.

For most questions, the amount of detail and the complexity of students' responses was lacking. It may be beneficial to students to complete past examinations and compare their written responses to what has been suggested in the corresponding examination report.

When preparing for the examination, students should also refer to the current *VCE Agricultural and Horticultural Studies Study Design* and the examination specifications for Agricultural and Horticultural Studies. Students need to be able to apply their understanding to a range of land, plant and animal management techniques in agricultural and horticultural businesses throughout Victoria.

This report should be read in conjunction with the 2016 VCE Agricultural and Horticultural Studies examination.

Specific information

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The statistics in this report may be subject to rounding resulting in a total more or less than 100 per cent.

Question 1

Students were required to state various actions that could be used to modify soil or climate. One-word answers were not acceptable.

This question was answered reasonably well. However, in part c. students needed to outline pre-sowing techniques for the germination of hard-coated seeds and students' knowledge of horticultural practices such as sowing techniques required improvement. In most of these responses the modification required some explanation.

Question 1a.

Marks	0	1	2	Average
%	29	31	40	1.1

Possible responses included (any two of):

- add organic matter, compost, humus (mulch was not accepted)
- add vermiculite
- add water-holding crystals
- mix in other soil types – clays or loams.

Question 1b.

Marks	0	1	2	Average
%	36	51	13	0.8

Possible responses included (any two of):

- improves fertility or adds nitrogen
- adds organic matter
- improves soil structure (responses also needed to comment on organic matter)
- improves water-holding capacity (responses needed to also comment on organic matter)
- includes rhizobia for future crops
- can acidify soils.

Question 1c.

Marks	0	1	2	Average
%	51	32	17	0.7

Possible responses included (any two of):

- abrasive sanding/including a nick in the seeds (scarification)
- soaking in boiling water (hot water was not accepted)
- soaking in acid solution
- exposure to heat and smoke.

Question 1d.

Marks	0	1	Average
%	40	60	0.6

The pH of neutral soil is 7.

Question 1e.

Marks	0	1	2	3	4	Average
%	12	14	23	26	26	2.4

Possible responses included (any two advantages and any two disadvantages):

Advantages

- shelter for animals/crops from the wind
- reduces wind chill
- reduce evapotranspiration from the paddocks (evaporation was accepted)
- increases biodiversity
- provides shade from the sun
- increases pasture growth
- reduces wind speed, which reduces erosion
- reduces spray drift from neighbouring properties

Disadvantages

- cost of establishment
- harbours pests and/or weeds
- time and cost spent maintaining and/or installing
- loss of pasture due to shading and competition for moisture
- creates camping areas for livestock, so leads to pasture loss
- livestock may be killed/injured by falling branches/trees
- loss of productive area

One-word answers were not accepted; for example, cost.

Question 2a.

Marks	0	1	2	Average
%	12	29	58	1.5

Students were required to state two methods of modifying farm topography. Any two of the following were acceptable.

- laser levelling
- contour banks
- raised beds
- terracing

Most students could state two methods of modifying the topography of a farm. The term 'contouring' was not acceptable unless reference was made to what was being contoured (e.g. banks).

Question 2b.

Marks	0	1	2	Average
%	56	27	17	0.6

Students chose one of the methods suggested in part a. and described the benefits to a farmer of altering the farm topography for a specific crop.

Chosen method	Crop	Benefits
laser levelling	<ul style="list-style-type: none"> pasture 	<ul style="list-style-type: none"> allow precision irrigation better distribution of water across paddock reduce water cost reduces raising of water table – salinity/waterlogging
contour banks	<ul style="list-style-type: none"> pasture/fruit trees 	<ul style="list-style-type: none"> control of water on slopes slowing it reduce erosion increase infiltration time makes more water available to crops allows easier access to some crops; for example, strawberries for hand-picking
raised beds	<ul style="list-style-type: none"> cropping/vegetables 	<ul style="list-style-type: none"> improved drainage (as it does not allow runoff) better aeration of soil compaction is limited or reduced prevents waterlogging
terracing	<ul style="list-style-type: none"> nurseries/cropping 	<ul style="list-style-type: none"> utilise land more fully where it was too steep to crop reduction of erosion safer use of equipment

Many students did not show understanding of the benefits of undertaking a modification of the topography. The study design specifically states that students need a thorough understanding of these methods.

Question 3a.

Marks	0	1	2	Average
%	51	42	7	0.6

Students needed to list two legal responsibilities of land owners with regard to managing local native vegetation on their property. Any two of the following were acceptable.

- protect the vegetation
- a permit is required when planning removal
- farmers are not allowed to remove native vegetation on their property unless given permission

Some students showed knowledge of the legal responsibilities. Many students wrote about removal of weeds, which was incorrect.

Question 3b.

Marks	0	1	2	3	4	Average
%	23	31	23	17	7	1.6

Students were required to outline four benefits of maintaining local native vegetation on a farm.

Any four of the following responses were acceptable.

- attracting birds

- increases the biodiversity of the property
- harbours beneficial insects
- wildlife corridor/habitat for native animals
- provision of shade
- shelter from wind
- improved pasture growth
- improved land values
- improved aesthetics
- local natives have adapted to better cope with local climatic and soil conditions
- acts as a carbon sink to reduce net greenhouse gas emissions
- reduces raising of water table – reducing incidence of salinity on the property
- filters runoff to improve creek water quality
- helps to prevent erosion by holding soil particles together

Some students were not able to state a benefit of native trees on a farm. Unit 4 of the study design covers whole-farm planning, which outlines the benefits of native trees in terms of maintaining a sustainable farm. Many responses were one-word answers, for example, shade or shelter; however, the question asked students to outline benefits and this required a short explanation – provides shade for livestock to reduce heat stress.

Question 4a.

Marks	0	1	2	3	4	5	Average
%	16	29	25	15	11	4	1.9

Students needed to choose one weed from the 2016 prescribed list and describe a detailed integrated weed management plan for controlling the chosen weed. Students needed to include and elaborate on all aspects below.

- knowledge of weed/life cycle
- monitoring of weed
- economical threshold
- biological control/mechanical/chemical control (students needed to name the biological agent/chemical)
- biosecurity plan
- timeline

Students were expected to have an understanding of each weed in the 2016 prescribed list. The level of response to this question by the majority of students was very limited.

Students are required to understand the life cycle of the weed and how it is monitored. Students need to understand the decision as to whether to act in controlling the weed when studying integrated weed management. Students will need to learn the specific methods of biological, mechanical or chemical control for their weed. As well as this students need to understand the important concept of biosecurity. When to undertake the various methods of control throughout the year is also required.

Question 4b.

Marks	0	1	2	Average
%	23	41	35	1.1

Students were required to identify a type of business that would be affected by the weed chosen in part a. and suggest two effects that the chosen weed would have on the type of business identified. Any two from the list below were acceptable for the weeds on the 2016 list.

Grazing

- competition with pasture plants for light, nutrient, water and make a connection to the effect on production; for example, less feed
- Cost of removal of weed, contamination of fleece, hay and effect on business

Cropping

- competition with cropping plants for light, nutrients, water; for example, reducing germination of crop seed, contamination of the crop, cost of removal of weed
- Patterson's curse is a weed that can be toxic to stock

Most students were able to explain an effect that their weed would have on their chosen business.

Question 5a.

Marks	0	1	2	3	Average
%	15	24	24	36	1.8

Students needed to identify one example of each of the following types of disease from the prescribed list of pests and diseases.

Type of disease	Example
metabolic	pregnancy toxaemia
metazoal	primary green blowfly (or Australian sheep blowfly), western flower thrips, liver fluke, aphids
microbial	coccidiosis, wheat rust, barley rust, grapevine rust, rose rust mastitis

Question 5b.

Marks	0	1	Average
%	7	93	1

Students were required to choose a pest or disease from the prescribed list and identify a specific agricultural or horticultural business it would affect.

The majority of students were able to identify a specific business.

Question 5c.

Marks	0	1	2	3	Average
%	22	34	32	11	1.3

Students needed to state three symptoms or signs that would indicate the presence of their chosen pest or disease in the business identified in part b.

Most students knew at least one sign or symptom of the pest or disease. However, an understanding of more signs and/or symptoms of pests and diseases was required by students.

Question 5d.

Marks	0	1	2	Average
%	39	38	23	0.9

An explanation of how the pest or disease could be quickly treated in an outbreak was required.

A minority of students could explain in detail how to treat the pest or disease quickly. The study design states that students require an understanding of the control measures of the six listed pests and/or diseases. Several responses indicated that students had no understanding of the control practice in the industry. This was evident when students wrote that a dairy cow that has mastitis must be treated with antibiotics and removed from the herd and put into quarantine. It may be beneficial for students to visit commercial agricultural and/or horticultural businesses to put the control of the pests and diseases in context.

Question 5e.

Marks	0	1	2	3	4	5	Average
%	20	29	28	16	6	1	1.7

Students were required to develop a plan for the ongoing control and/or eradication of the pest or disease chosen in part b. A detailed plan that included all of the following was required.

- biosecurity plan
- steps in biosecurity; for example, quarantine prior to introduction to property
- monitoring
- preventative measures; for example, crutching, drenching, predator introduction

The majority of responses to this question were limited in content. Students need to develop detailed and coordinated strategies for their chosen pest or disease.

Question 6a.

Marks	0	1	2	3	Average
%	63	21	10	6	0.6

Students were given an unlabelled diagram of a property that had a salinity problem. Students needed to label the diagram using appropriate terminology and give a detailed explanation of how the salinity problem was likely to have occurred.

Students were expected to describe the principles involved in dry land salinity, including:

- Salinity affects lower regions because the water table rises.
- The rising water table brings naturally occurring dissolved salts up to the root zone or to the surface.
- The water table rises because of increased infiltration of rain water due to the removal of deep-rooted vegetation or due to excessive irrigation from the creek.
- Deep-rooted vegetation removes water from the soil profile through evapotranspiration.
- The recharge area is often defined as on the upper slopes.
- The discharge area is usually on the lower slopes where the water table rises close to the surface.

The majority of students showed a lack of understanding of the causes of salinity. Many suggested that the problem of salinity in the lower section of the property was due to excessive water running down the slope. Many students did not understand that it was due to a rising water table that brought salt to the surface.

Students should have a good knowledge of all forms of land degradation and its causes.

Question 6b.

Marks	0	1	2	Average
%	85	10	6	0.2

Students were required to describe one method Jennifer could use to monitor the level of the water table of the flatter land near the creek.

Responses showed that the majority of students did not understand how to measure the level of the water table. This question assessed students' understanding of environmental indicators and how they can be measured over time.

Question 6c.

Marks	0	1	2	3	4	5	6	Average
%	38	13	17	14	11	5	3	1.8

Students were required to suggest two strategies that Jennifer could use to manage the salinity problem. These include:

Strategy	Explanation
plant deep-rooted plants in the recharge area	over a period of time, this will lower the water table as the plants will remove the water by evapotranspiration
retain remnant vegetation	over a period of time, this will lower the water table as the plants will remove the water by evapotranspiration
fence off affected areas	reduce further damage by stock
improve drainage	reduce the level of the water table
pump water from the water table	reduce the level of the water table
use salt-tolerant pasture or crop species	reduce effect of salinity, increase productivity of the affected area, reduce further degradation
reduce irrigation rate	less infiltration so lower water table and less salt brought to the surface

The majority of students were able to give limited information as to how to manage the salinity problem on the property.

Question 7a.

Marks	0	1	2	3	4	5	6	7	8	9	Average
%	14	14	14	16	15	11	12	2	1	0	3.1

Students were required to show an understanding of the agricultural and horticultural activities and processes that produce greenhouse gases.

For each gas students needed to name an associated agricultural and horticultural activity that could cause the gas to be released

They then had to explain how the gas is most likely to have been produced by the activity.

Methane (CH₄)	<p>Associated activity that releases this gas</p> <p>Livestock belching/passing wind, effluent ponds</p>
<p>Explanation</p> <ul style="list-style-type: none"> The process of fermentation with ruminates produces methane (from the ruminant micro flora including/bacteria and protozoa). Anaerobic breakdown in effluent ponds, decaying crop matter. 	
Carbon dioxide (CO₂)	<p>Associated activity that releases this gas</p> <p>Use of tractors, vehicles, electricity, etc.</p>
<p>Explanation</p> <ul style="list-style-type: none"> The burning of fossil fuels that create CO₂. The use of electricity from fossil fuels. 	
Nitrous oxide (N₂O)	<p>Associated activity that releases this gas</p> <p>Irrigation, use of nitrogenous fertilisers, use of legume crop, animal urinating</p>
<p>Explanation</p> <ul style="list-style-type: none"> use of nitrogenous fertilisers in waterlogged conditions use of legumes leading to nitrification urine in the soil: urea converted by bacteria into NO₂ 	

Most students were able to list the three greenhouse gasses. However, students found it difficult to explain how these gases were generated on the farm. For full marks in relation to methane production students needed to state the presence of bacteria and protozoa in the rumen and their role in gas formation.

For carbon dioxide students needed to mention the burning of fossil fuels.

Further improvement is required on how nitrous oxide is produced in the soil and the role of bacteria in the soil.

Question 7b.

Marks	0	1	2	3	4	5	Average
%	14	13	13	28	23	8	2.6

Students were given the following specific effects of climate change in Victoria.

- decreasing annual rainfall
- increasing average temperatures
- increasing incidences of extreme weather events, for example, unseasonal intense summer rainfall

Students were required to identify one type of agricultural or horticultural business, suggest a management strategy for that business and explain how it could be used to reduce the risks associated with the effects of climate change. Some suggested responses are as follows:

- Business type: Dairy
- Management strategy for increased temperatures over extended time: need shelter, water management
- Explanation: In extreme events, need to manage fodder, effluent and lower areas. With decreased rainfall, need water conservation, changes to irrigation methods and reduced stocking, and manage increased cost of water
- Business type: Cropping
- Management strategy: change in varieties, use of irrigation, changes to timings of planting /harvesting
- Explanation: insurance, management of new pests and diseases, and increased cost of water
- Business type: Orchard/Viticulture
- Management strategy: change in varieties, changes in type of irrigation, changes to timings of planting/harvesting
- Explanation: insurance, storm cloth protection over trees and vines, spray UV protection film. Management of new pests and diseases, increased cost of water
- Business type: Nurseries
- Management strategy: change in varieties, protected growing (igloos, glasshouses), changes to watering systems, shade protection
- Explanation: management of new pests and diseases, increased cost of water
- Business type: Beef/sheep
- Management strategy: provide more shelter, fodder conservation, reduced stocking rates
- Explanation: will reduce incidence of heat stress and manage increased cost of water

Most students were able to show a reasonable understanding of management strategies required.

Question 8a.

Marks	0	1	2	3	4	5	6	7	8	Average
%	21	2	6	20	14	9	14	8	6	3.9

Students needed to describe two new and emerging technologies that can be used in an agricultural or horticultural business. For each technology the student needed to identify what it is used for and describe how it works.

The majority of students showed some understanding of new and emerging technologies. However, some students wrote about technologies that have been in existence and have been used widely for longer than five years. Few students wrote about apps.

Many students did not explain in detail how the technology works. Many of the explanations were simplistic. Students needed to state clearly what the new and emerging technology was and how it works.

Question 8b.

Marks	0	1	Average
%	38	62	0.6

Students were required to choose one of the technologies named in part a. and identify the technology it would replace.

Question 8c.

Marks	0	1	2	3	4	Average
%	38	14	18	12	18	1.7

This question required students to evaluate the impact of the new technology chosen in part b. on the sustainability of the business.

Students needed to explain how this technology would impact the business specifically in terms of environmental, economic and social sustainability. Many students stated impacts related to economics but many failed to cover the environmental and social aspects of the new technology.

Question 9

Students needed to choose one type of agricultural or horticultural business that they had studied during the year or one that they were familiar with in terms of its business operations. The main product for this type of business was also required.

Question 9a.

Marks	0	1	2	Average
%	37	36	27	0.9

Students were required to describe a marketing strategy that could be used to promote the chosen main product to consumers and indicate why the strategy suggested would be effective.

The marketing strategy should have been appropriate to the size and location of the business. For example, a small business may target locals by printing posters/pamphlets promoting their main product and distributing them through mail drops. This may be effective because it will reach people who will have easy access to their outlet, or be close for delivery. Another strategy could be giving free, or cut-price, samples at local events such as farmers markets. This would target local people and those looking for fresh local produce.

Students showed some understanding of the marketing strategies.

Question 9b.

Marks	0	1	2	3	Average
%	53	9	26	12	1

Students were required to state one information and communications technology (ICT) application that a business manager could use in decision-making for their chosen business. They then needed to describe how the chosen ICT application could be used to make decisions to improve business productivity.

A specific application needed to be mentioned, not a generic type of software.

Responses needed not only to explain what the ICT application does, but make a link to business productivity. For example, the application might help analyse data to show which products are making the better returns.

This question was not answered well, with a minority of students showing understanding of the use of ICT to evaluate business performance.

Question 9c.

Marks	0	1	2	Average
%	71	26	3	0.4

This question required students to outline the importance of developing a cash flow estimate as part of a business plan for their chosen business.

Answers should have covered the following elements:

- ensure a positive cash flow on a short-term basis, for example, monthly, thus able to pay your bills
- better budgeting and planning for purchasing
- know where your business is at any point in time
- key detail about the predicted movement (i.e. flow) of money in/out of the business, for example, monthly.

Students' understanding of the purpose of cash flows was extremely limited. When developing a proposal for their business at the beginning of the year, all students should develop a cash flow.

Question 9d.

Marks	0	1	2	Average
%	54	27	18	0.7

Students needed to describe one possibility for adding value to the main product. For example:

- processing own meat if a beef or sheep, poultry/pig producer
- packaging/marketing of a niche product; for example, lettuce mix.

Students lacked understanding of what value-adding is. Simply, it is increasing the value of a raw product by altering it in some way to increase its value. Some additional input costs may be required to achieve this.

An example may be the growing of a punnet of marigolds and selling it for \$3.50. To value-add this product the person may decide to remove the 10 seedlings from the punnet and place them into separate pots to create potted colour. Each pot could be sold for \$2.50 each. The total income becomes \$25.00. (Note, the costs of production have not been taken into consideration.)

Question 9e.

Marks	0	1	2	3	Average
%	65	18	12	5	0.7

This question required students to estimate the additional income that could be made from the value-added product. They needed to use simple figures and give an explanation to support their estimate of the additional income.

A full response should have included:

- the estimated cost of producing the raw product
- the extra cost of value-adding
- the estimated income from the raw and value-added products
- the calculation of the increased income due to value-adding.

Question 9f.

Marks	0	1	2	3	4	5	6	7	8	Average
%	15	0	4	17	14	4	17	18	10	4.5

Students needed to identify two different health and safety risks to an employee in their chosen type of business. For each risk identified they needed to describe how the risk could occur and suggest two strategies that could be used to minimise the potential risk to an employee.

Examples could have included:

- cattle: crush injuries, chemicals, sun
- cropping: machinery, sprays
- nursery: lifting, chemicals
- orchards: sprays, sun.

Students needed to give a specific disease/illness, not just getting sick or having a disease. The two examples needed to be distinct from each other and related to the business.

Most students could explain a health and safety issue. However, explanations were often simplistic and lacked detail.