2012   Agricultural and Horticultural Studies GA 3: Written examination

GENERAL COMMENTS

Students demonstrated a reasonable understanding of modifying climate, soil/growing media and water for improving animal or plant nutrition. It is important that students focus on modification of soil, climate and topography using both horticultural and agricultural contexts.

Students were generally able to name one weed from the Prescribed list of pests, diseases and weeds for 2012 that was spread by wind. The various methods that seeds could be spread other than wind were well understood. However, few students were able to provide a well-structured response outlining an integrated weed management program for their selected weed. Many responses were general. It is important that students are able to give an indication of the biosecurity measures that could be undertaken and that control methods should include biological, cultural and chemical strategies. Simply writing that a weed can be killed by a chemical spray is not sufficient. Few students were able to give a timeframe as to the most effective time to control the weed.

Students were required to select technological area from a table for which they knew an example of new or emerging technologies, and name and describe an innovation applicable to the technological area; however, many of the answers given were not new or emerging. Answers such as artificial insemination or breeding cows showed that students were ill-prepared for this question.

Students were able to state the most likely land degradation problem in a case study. Their ability to state an appropriate management strategy was, however, somewhat limited. It is important that all listed forms of degradation in the study design are covered and that students can apply them to case studies.

Students were required to name three greenhouse gases that contribute to climate change and the contributing process. While most students could name some gases, fewer students could state the contributing process. A very small number of students were able to suggest a management strategy that could be introduced to reduce emissions. This area of study is relatively new and needs greater emphasis.

Students need to differentiate between measures that reduce the cause of global warming; for example, reduce greenhouse gas production, and strategies that need to be put in place that address the impact of climate change; for example, growing a new drought-tolerant wheat variety.

When preparing students for the examination, teachers must refer to the current *VCE Agricultural and Horticultural Studies Study Design* and the examination specifications and sample questions 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 2012 VCE Agricultural and Horticultural Studies written examination.

SPECIFIC INFORMATION

Note: Student responses reproduced in this report have not been corrected for grammar, spelling or factual information.

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

Question 1ai.

Marks	0	1	2	Average
%	46	38	16	**0.7**

Ways the environment can be modified include (any of)
- nutrition
- water and feed
- shelter
- pest control

- disease control
- weed control
- water availability
- temperature control
- animal hygiene
- minimise stress
- quarantine or segregation.

1aii.

Marks	0	1	2	Average
%	43	44	14	**0.7**

Any two of
- correct storage
- correct handling
- protection from vermin
- correct packaging
- fresh seed
- clean water
- adequate aeration
- optimum propagating medium/soil
- optimum temperature
- scarification
- chemical treatment (such as fungicide or insecticide)
- pelleting
- appropriate seed harvesting
- seed bed preparation.

1aiii.

Marks	0	1	2	Average
%	42	38	20	**0.8**

Any two of
- use flocculating agents
- grassed waterways catchment
- filtration
- reduce algal growth
- reduce infestation of fish, such as European carp
- control stormwater flows – reduce upslope erosion
- stock exclusion
- avoid bank erosion
- fence off the dam-control access
- add lime or gypsum
- add straw.

1b.

Marks	0	1	2	3	Average
%	12	35	39	15	**1.6**

Any three of the following
- use green manure
- correct fertility levels
- add gypsum
- add humus
- use water-holding crystals
- alter pH
- use appropriate tillage techniques
- add organic matter.

1c.

Marks	0	1	2	3	Average
%	5	18	42	35	**2.1**

Any three of
- temperature control
- moisture control
- humidity control
- weed control
- disease control
- drainage
- shade
- shelter
- pest control
- water quality.

1d.

Marks	0	1	2	3	Average
%	4	14	45	37	**2.2**

Any three of
- light control
- adequate nutrition
- adequate housing
- shading
- temperature control (including sprinklers and fans)
- feed pad
- disease control
- pest control
- adequate space
- calm environment.

Question 2ai.

Marks	0	1	2	Average
%	31	63	5	**0.8**

Both of
- ragwort (or *Senecio jacobaea*)
- serrated tussock (or *Nassella trichotoma*).

Question 2aii.

Marks	0	1	2	3	Average
%	4	9	26	60	**2.5**

Three of
- seed falls to the ground
- came in stock feed
- brought in and spread by stock, machinery, people/animals (including wild animals)
- carried on or in the water
- explosive ejection.

2b.

Marks	0	1	2	3	4	5	Average
%	10	25	26	23	13	2	**2.1**

This question required students to develop a biosecurity plan including an integrated weed management approach.
Aspects that needed to be considered included
- accurately identify the weed as being a problem
- assess the scale of the problem, prioritise the sequence for treating weedy areas
- combine all available weed-management options

- when herbicides are used, follow-up (repeated) applications may be required for several years, until the weed populations are below the economic injury level
- to avoid/delay the onset of herbicide resistance, herbicide products with different modes of activity must be used on a rotational basis to reduce weed populations
- monitor and review the performance of all integrated weed management practices – modify practices to achieve optimum weed management.

One mark was awarded for farm biosecurity measures, three marks for different integrated weed management strategies (e.g. biological, chemical, mechanical/management) and one mark for timing.

Specific biosecurity measures can be found on the Department of Primary Industries website.

Question 3a.

Marks	0	1	2	3	4	Average
%	46	31	15	7	2	0.9

Students were required to fill in the blank spaces in the table.

Table 2. Examples of pests and diseases of concern in Victoria

Common name	Scientific name	Animal or plant it affects (host)
aphids	assorted species	(Ornamental plants, vegetables)
footrot	*Dichelobacter nodosus*	3. sheep goats horses cattle
grass tetany	2. Hypomagnesaemia	sheep goats cattle
intestinal worms (ruminants)	assorted species	cows sheep goats
cattle lice sheep lice equine lice chicken body lice	*Linognathus vituli* *Bovicola bovis* *Haematopinus asini* *Menacanthus stramineus*	cattle sheep horses fowl
1. Newcastle disease	*Avian paramyxovirus*	poultry
mastitis	N/A	4. Any one of • cattle • sheep • goats
stem and bulb nematodes	*Ditylenchus dipsaci*	grain crops, potatoes, legumes, bulb flowering plants (e.g. tulip, daffodil)

This question was poorly answered. Students are given the list of diseases to be studied and should have some knowledge of the plant/animal that is affected as well as the name of the pest/disease organism.

The study design states that students need to study all the pests, diseases and weeds from the Prescribed list of pests, diseases and weeds published in the *VCAA Bulletin VCE, VCAL and VET* each year. Students should know the common and scientific name of the pest/disease and an example of the animal or plant it affects. Students were generally unable to list the disease or pest name or state the target animal or plant. Students were able to list the signs and symptoms of their chosen pest of disease quite well. Students struggled to explain how their pest or disease could be monitored or prevented from becoming a problem. Control of the pest or disease was well answered. Students need to have a thorough knowledge of the pests and diseases in order to demonstrate a good understanding.

3bi.

Marks	0	1	Average
%	33	67	0.7

Students were required to select a pest or disease from the table and state the signs/symptoms it would produce.

The signs/symptoms listed can be sourced from the Department of Primary Industries website.

One mark was awarded if two or more correct signs/symptoms were stated. This question was generally well answered, with most students able to list a number of signs/symptoms.

3bii.

Marks	0	1	Average
%	51	49	0.5

Students were required to explain how the pest or disease could be monitored.

The methods of monitoring the pest and/or disease can be sourced from the Department of Primary Industries website.

One mark was awarded for a well-thought-out strategy to monitor the pest or disease. Many students were able to suggest a strategy.

3biii.

Marks	0	1	2	Average
%	43	42	15	0.7

Students were required to explain how the source of the disease or pest could be controlled, taking into account how the environment could be managed so that it does not favour the pest or disease.

The control of the pest and/or disease listed can be sourced from the Department of Primary Industries website.

One mark was awarded for a response that listed a strategy. Two marks were awarded for detailed responses that include several strategies. Only half of the students could suggest an effective strategy and few were able to give a detailed response.

3biv.

Marks	0	1	2	Average
%	24	51	26	1

Students were required to suggest two control methods for their chosen pest or disease.

Control methods for pests and diseases can be sourced from the Department of Primary Industries website.

One mark was awarded for listing two methods of control. Two marks were awarded for two well-explained methods of control. Most students could list at least two methods of control. Few students could explain the strategy in detail.

3bv.

Marks	0	1	2	Average
%	36	52	11	**0.8**

Students needed to explain appropriate timing for the control of their pest or disease. The timing depended on the disease or pet selected.

Answers should have shown an understanding of the pest or disease's lifecycle and the best time to apply the appropriate control. One mark was awarded for stating that the control should be applied as soon as it is seen. Two marks were awarded for a detailed response that covered the critical timing. The majority of students could list one response to timing.

4ai.

Marks	0	1	2	Average
%	49	16	35	**0.9**

Students were required to select two technological areas from a table for which they knew an example of two new or emerging technologies. They were then required to name an innovation applicable to the technological area chosen and describe how it works.

If the technology or innovation was not new or emerging, no marks were awarded. Examples of technologies that were not accepted included animal breeding, auto sprinkler system, electronic ear tags, laser levelling, solar heating, no-till farming and refrigerated trucks.

Many students were not able to identify an appropriate new or emerging technology. It is important that students study a range of new and emerging technologies as required by the study design.

One mark was awarded for listing an appropriate technology. One mark was awarded for a good description of the technology. No marks were awarded for inappropriate technologies.

4aii.

Marks	0	1	2	3	4	Average
%	48	11	17	20	5	**1.3**

One mark was awarded if an advantage or disadvantage was listed. Two marks were awarded if an advantage and a disadvantage were listed. Three marks were awarded if two advantages and two disadvantages were discussed and four marks were awarded if students explained how the new innovation would improve the sustainability of the business.

Only half of the students were able to list or explain the advantages or disadvantages of the new or emerging technology.

4bi.

Marks	0	1	2	Average
%	52	16	31	**0.8**

One mark was awarded for listing an appropriate technology. One mark was awarded for a good description of the technology.

4bii.

Marks	0	1	2	3	4	Average
%	50	10	19	18	3	**1.2**

One mark was awarded if an advantage or disadvantage was listed. Two marks were awarded if an advantage and disadvantage were listed. Three marks were awarded if two advantages and two disadvantages were discussed and four marks were awarded if students explained how the new innovation would improve the sustainability of the business.

Question 5

Case study chosen	none	1	2
%	1	56	43

5a.

Marks	0	1	2	3	4	5	6	Average
%	10	10	16	22	11	16	15	**3.3**

The likely problem that existed for the case studies included
- salinity
- water quality/eutrophication/algal blooms
- waterlogging.

Evidence included (one of)
- unhealthy plant appearance, consistent with high saline soil conditions
- white crystalline substance
- plants stunted and wilted
- unhealthy plant appearance, consistent with waterlogging – plants are unable to take up water in low-lying land
- algal blooms are becoming a common occurrence in the dam.

One mark was awarded for identifying the problem and two marks for stating the evidence in the case study.

Students were generally able to identify the problems associated with the case studies. Most were able to give supporting evidence from the case study.

5b.

Marks	0	1	2	3	4	5	6	7	8	Average
%	27	19	20	13	10	5	3	2	1	**2**

Management strategies included the following.

Waterlogging
- identify ways to improve drainage
- grow on raised beds
- do not grow plants there
- maintain better irrigation control through a different system; for example, drippers, different sprinklers, lower pressure

Salinity
- fence off and do not grow plants there
- maintain better irrigation control through a different system; for example, drippers, different sprinklers, lower pressure
- identify recharge sites and catchment issues
- plant trees in recharge sites
- reduce water flow to the area
- divert water away
- plant deep-rooted plants

Algal blooms
- collect runoff to settling tanks/ponds/dams
- reuse the water on the property
- develop plant density in the riparian zone around the dam/creek
- reduce runoff
- maintain better irrigation control through a different system; for example, drippers, different sprinklers, lower pressure

One mark was awarded for each correct strategy listed up to three marks. One mark was awarded for a detailed answer.

Students did not demonstrate a good understanding of the management strategies required to fix the problem. Many students could only describe one strategy or were unable to describe any strategies.

5c.

Marks	0	1	2	Average
%	40	45	15	**0.8**

Environmental indicators included the following.

Salinity
- Water table level measurement: measurements tell exactly where the water table level is and allow it to be monitored for change. Over time, if the strategies have been successful, it should drop.
- Salt readings: take EC readings and measure the concentration of salt in the soil. Again, this needs to be monitored and should reduce if the strategies are successful.
- Monitor changes in vegetative cover and the type and extent of indicator plants; for example, yellow buttons.

Waterlogging
- Monitor the depth of the water table.
- Check the water-holding capacity. The amount of water the soil can hold will influence irrigation frequency.
- Air-filled porosity: the drainage capability of the soil affects the rate of irrigation and the soil's ability to handle higher rainfall before surface runoff occurs.
- Look for a decrease in the presence of indicator plants; for example, sedges, and an increase in quality vegetative cover, type and extent.

Algal blooms/eutrophication
- Check nutrient levels in runoff, dams and creek.
- Monitor the frequency and severity of the algal blooms.

One mark was given for naming an indicator for the two environmental problems to a maximum of two marks. Half of the students could describe at least one indicator, while few could describe two.

5d.

Marks	0	1	2	Average
%	33	18	50	**1.2**

An illegal practice is to allow excess irrigation flowing onto the neighbour's property and entering his dam or adjoining creek.

One mark was awarded for a brief response. Two marks were awarded for an extended explanation.

5e.

Marks	0	1	2	3	Average
%	52	28	14	7	**0.8**

The relevant Act is *The Catchment and Land Protection Act 1994*.

Any two of the following responses were acceptable.
- The Act establishes protection for primary production Crown land, the environment and community health from the effects of noxious weeds, pest animal and water quality.
- Further, the Act prohibits the movement and sale of all categories of noxious weeds, including the seeds of any noxious weed and any part of a noxious weed that is capable of growing, without a permit.
- Land owners have a responsibility to manage water on their farm in a way that does not adversely affect commercial agricultural production on neighbouring farms, and to ensure that the quality of any water leaving the farm does not have an adverse impact on a waterway.

One mark was awarded for correctly naming the Act and one mark each for correctly identifying two reasons.

This is one of the main Acts that affects agricultural and horticultural production. Only half of the students were able to state the relevant Act.

Question 6a.

Marks	0	1	2	3	4	5	6	Average
%	16	10	19	12	26	11	8	**2.9**

Students were required to list three greenhouse gases and the contributing process.

Greenhouse gas	Contributing process(es)
Carbon dioxide or CO_2	• use of fossil fuels in machinery • accelerated soil organic matter breakdown • clearing vegetation • use of equipment and materials (e.g. fertiliser) for which fossil fuels were used in production and transport (not crop stubble burning or animal respiration)
Nitrous oxide or N_2O	Build-up of available nitrogen in soil through • use of nitrogen containing materials (fertilisers, manure etc.) • growing nitrogen fixing plants such as legumes • animal urine deposits • wet soils • denitrification.
Methane or CH_4	• ruminant animal digestion • wetlands or swamps • livestock enteric fermentation • livestock waste management • rice cultivation • agricultural waste burning
Water vapour	• irrigation from groundwater • increased transpiration from trees

One mark was awarded for listing the contributing gas and one mark was awarded for stating a contributing process (up to a total of six marks).

Half of the students were able to list the greenhouse gases, while the other half demonstrated little knowledge.

6b.

Marks	0	1	2	Average
%	49	34	17	**0.7**

Students were required to suggest one possible management strategy that could be introduced to reduce the emissions of one of the greenhouse gases.

Greenhouse gas	Possible emission reduction strategies
Carbon dioxide or CO_2	• reduce use of fossil fuels in machinery • increase soil organic matter or soil organic carbon • plant trees • reduce use of equipment and materials (e.g. fertiliser) for which fossil fuels were used in production and transport
Nitrous oxide or N_2O	• reduce use of materials containing nitrogen (fertilisers, manure, etc.) by matching application to plant requirements • if growing nitrogen-fixing plants such as legumes, include other plants to use up excess nitrogen, manage animal urine/manure deposits • avoid available nitrogen in wet soils • use of nitrification inhibitors or slow-release fertilisers.

Methane or CH$_4$	• manipulate feed of ruminant animals to reduce methane production • reduce number of ruminant animals • reduce carbon inputs into wetlands or swamps/avoid flooding carbon-rich soils • livestock waste management to reduce methane production – drying, composting and pyrolysis • rice cultivation – avoid paddy production on carbon-rich soils • avoid agricultural waste burning
Water vapour	Reduce evaporation

One mark was given for listing the strategy, with two marks awarded for a detailed explanation as to how the emission is reduced.

Question 7ai.

Marks	0	1	Average
%	24	76	**0.8**

One mark was given for identifying the nature of the customer, such as direct to consumer, wholesaler, retailer and processor.

Students were asked to name an agricultural or horticultural business they were familiar with. Many focused on their own business. However, this question related to a large commercial business that students should have been familiar with. It could have been a broiler farm or a broad-acre wheat property. The subsequent questions related to this large business. Quality assurance still appears to need further discussion in class as few students showed a sound understanding of the process. Identifying a method to measure the ecological impact of the business also needs further work by both teachers and students.

7aii.

Marks	0	1	Average
%	33	67	**0.7**

One mark was given for correctly identifying the main inputs of the enterprise.

7aiii.

Marks	0	1	2	Average
%	20	39	41	**1.2**

One mark was given for each correctly identified main process (up to two marks). At least two processes needed to be provided.

7aiv.

Marks	0	1	Average
%	29	71	**0.7**

One mark was given for correctly identifying the main outputs.

7b.

Marks	0	1	2	3	Average
%	31	43	20	7	**1**

Documentation required by a lender to provide finance for the business included a (three of)
• production plan, including, access to inputs, timeline and quality assurance
• marketing plan, including market requirements of quality and supply
• establishment costs and ongoing costs
• expected cash flow and returns on production.

One mark was awarded for each correct aspect of the documentation (up to three marks).

7c.

Marks	0	1	2	3	Average
%	41	44	14	2	**0.8**

A strategy that would help to maintain the quality of the business's product or service to meet market expectations should include
- regular audits/inspections/checks, identifying main threats to quality
- appropriate monitoring points and/or measurement
- monitoring of inputs

One mark was awarded for identifying quality assurance principles and one mark for monitoring techniques. Three marks were awarded for a well-thought-out strategy.

The process of quality assurance is still not well understood. Few students showed understanding of the concept.

7d.

Marks	0	1	2	3	Average
%	31	45	20	4	**1**

Methods that could be applied to analyse financial performance include
- budget versus actual comparison
- profit and loss statements
- benefits and costs of activities

7e.

Marks	0	1	2	3	Average
%	58	27	12	3	**0.6**

Methods in calculating the ecological impact of the business included
- identifying an approach, such as an ICT application
- identifying an approach that could be used to calculate the extent of various forms of land degradation.

One mark was awarded for identifying each components, and one mark for relating this to the specific business.

The majority of students did not show a good understanding of this question. Only a few were able to give real examples of methods to calculate the ecological impact.

7fi.

Marks	0	1	Average
%	57	43	**0.5**

Students were required to state one innovation that could be introduced to address the impact of climate change. One mark was awarded for identifying an appropriate innovation to analyse. Answers were varied and needed to state a relevant strategy.

Many students had little knowledge of strategies that could be put in place to address the impact of climate change. Many students did not understand what was being asked for in the question.

7fii.

Marks	0	1	2	3	4	Average
%	58	14	14	10	4	**0.9**

A SWOT (strengths, weaknesses, opportunities, threats) analysis was required for the suggested innovation. It should include
- effectiveness of innovation in addressing climate change impact (strengths)
- disadvantages/uncertainty of the innovation (weaknesses).
- how the innovation will sustain or increase business profits, and or open up opportunities (opportunities)
- disruption to the business and cost, and or other risks (threats).

This question was poorly answered due to students selecting an incorrect innovation. More discussion in class related to methods that farmers or horticulturalists could use to address the effects of climate change would help to improve students' understanding. For example, the planting of wheat varieties that can cope with increased water stress without reduced yield.