

2018 HSC Agriculture Marking Guidelines

Section I, Part A

Multiple-choice Answer Key

Question	Answer
1	A
2	C
3	D
4	B
5	A
6	A
7	D
8	C
9	B
10	C
11	A
12	B
13	A
14	A
15	B
16	C
17	C
18	D
19	D
20	B

Section I, Part B

Question 21 (a)

Criteria	Marks
• Identifies TWO relevant nutrients	2
• Identifies a relevant nutrient	1

Sample answer:

Nitrogen, phosphorus

Answers could include:

Any two relevant elements, ions or compounds by name or by chemical symbol.

Question 21 (b)

Criteria	Marks
• Outlines TWO benefits of this crop rotation	2
• Outlines a benefit of this crop rotation OR makes a relevant point	1

Sample answer:

Legumes provide nitrogen for growth of the following non-legume crop thus increasing production. This also means the farmer spends less on buying fertiliser.

Answers could include:

- Pest control
- Breaking a disease cycle
- Weed management.

Question 21 (c)

Criteria	Marks
• Demonstrates a clear relationship between the strategy used and how it alleviates the named soil degradation problem	4
• Demonstrates some relationship between the strategy used and how it alleviates the named soil degradation problem	3
• Outlines a strategy which is used to alleviate the named soil degradation problem	2
• Makes a relevant point	1

Sample answer:

Soil erosion

Planting trees or groundcover (pasture) will prevent the soil moving from one place to another. The roots from plants hold the soil together and maintain its structure against the effects of wind and water.

Question 22 (a)

Criteria	Marks
• Demonstrates the relationship between the ways used and how they manage competition in plant communities	4
• Demonstrates some relationship between a way used and how it manages competition in plant communities AND identifies another strategy OR • Demonstrates a limited relationship between ways used and how they manage competition in plant communities	3
• Outlines a way used to manage competition in plant communities	2
• Identifies one or more ways used to manage competition in plant communities	1

Sample answer:

Removing weeds using methods such as hand weeding or chemical spraying can reduce competition for water and nutrients. This allows the crop plants to maximise their production.

Another strategy is precision planting using specialised equipment to sow/transplant the crop at the correct spacing. This method allows for optimum density, which will ensure minimum competition between the crop plants and maximise growth.

Question 22 (b)

Criteria	Marks
• Demonstrates a clear relationship between the method used and how it overcomes the effects of temperature	4
• Demonstrates some relationship between the method used and how it overcomes the effects of temperature	3
• Outlines a method that can be used to overcome the effects of temperature	2
• Makes a relevant point	1

Sample answer:

Farmers can cover crops such as orchards with a material called frost cloth. This cloth holds heat in the orchard and will stop frost forming on the flowers. This ensures that the fruit will set rather than the flowers dying.

Question 23 (a)

Criteria	Marks
• Describes how a factor can increase or decrease supply	3
• Outlines how a factor can increase or decrease supply	2
• Identifies a factor that can increase or decrease supply	1

Sample answer:

A factor that affects supply of bananas is a natural disaster such as a cyclone. This can damage the crop causing an immediate reduction in supply. There will be a longer term decrease in supply as the orchard may need time to recover, or even be replanted.

Question 23 (b)

Criteria	Marks
<ul style="list-style-type: none"> Provides characteristics and features of TWO methods that can increase the demand for agricultural products 	6
<ul style="list-style-type: none"> Provides characteristics and features of a method that can increase the demand for agricultural products AND outlines another method 	5
<ul style="list-style-type: none"> Outlines two methods that can increase the demand for agricultural products 	4
<ul style="list-style-type: none"> Provides characteristics and features of one method that can increase the demand for agricultural products <p>OR</p> <ul style="list-style-type: none"> Outlines one method AND identifies a second method which can increase the demand for agricultural products 	3
<ul style="list-style-type: none"> Outlines one method which can increase the demand for agricultural products <p>OR</p> <ul style="list-style-type: none"> Identifies two methods which can increase the demand for agricultural products 	2
<ul style="list-style-type: none"> Makes a relevant point 	1

Sample answer:

Advertising can increase demand for a product. Social media can be used to draw in consumers by having recipes, nutritional information and aspects of growing. TV advertising can also draw consumer attention to buying the product.

Price reduction. Retailers create 'specials' so that consumers can afford to purchase more of the product for the same price, or purchase the product in preference to another.

Question 24

Criteria	Marks
<ul style="list-style-type: none"> Provides clear points for and/or against using artificial insemination with particular reference to animal welfare AND genetic gain 	6
<ul style="list-style-type: none"> Provides points for and/or against using artificial insemination with particular reference to animal welfare AND genetic gain 	5
<ul style="list-style-type: none"> Describes artificial insemination with some reference to animal welfare AND/OR genetic gain 	3–4
<ul style="list-style-type: none"> Outlines artificial insemination OR <ul style="list-style-type: none"> Outlines a relevant animal welfare issue OR <ul style="list-style-type: none"> Outlines an issue related to genetic gain 	2
<ul style="list-style-type: none"> Makes a relevant point 	1

Answers could include:

Animal welfare

- Farmers do not need to maintain males on the property – no chance of unexpected matings with immature females. Females are not subjected to heavy aggressive males during a natural mating.
- Stress can be caused if handlers are not familiar or trained in AI procedures and diseases may be transmitted if AI is done in an unhygienic manner.

Genetic gain

- Easier selection of superior sires including those from overseas. Targeted herd improvement using EBVs provided by registered AI sires.
- Possible narrowing of gene pool.

Question 25 (a)

Criteria	Marks
<ul style="list-style-type: none"> Describes TWO elements of the trial that contribute to validity 	4
<ul style="list-style-type: none"> Describes an element of the trial that contributes to validity AND identifies another 	3
<ul style="list-style-type: none"> Outlines TWO elements of the trial that contribute to validity 	2
<ul style="list-style-type: none"> Identifies element/s of the trial that contribute to validity 	1

Sample answer:

Including a recommended fertiliser level is a control in this experiment. It gives a base level to compare the treatments of High vs Low fertiliser levels.

Multiple pots of each plant in a treatment provides replication which is more valid than having only one plant. The average performance of a group is a better representation of effect than the performance of a single individual.

Question 25 (b)

Criteria	Marks
• Provides a relationship between a change in the trial design and improved validity	4
• Describes an appropriate change to the trial design	3
• Outlines appropriate changes to the trial design	2
• Identifies a problem within the trial design	1

Sample answer:

Standardisation in this trial is poor as there are different varieties of plants in each treatment group. The results of the trial could be due to the plant variety rather than the fertiliser level applied. The trial should use the same plant variety eg Variety 1 treated with 3 different fertiliser levels.

Question 25 (c)

Criteria	Marks
• Links the standard deviation in this trial to an aspect of the trial	2
• Identifies the purpose of the standard deviation	1

Sample answer:

High and recommended treatments have a mean representative of the group performance as the standard deviations are relatively small. Low treatment has a high standard deviation so results are too variable to use the mean as a valid representation.

Question 26 (a)

Criteria	Marks
• Identifies TWO quality criteria for the product	2
• Identifies a quality criterion for the product	1

Sample answer:

Milk
 (3.9%) butterfat
 (3.2%) protein

Question 26 (b)

Criteria	Marks
• Demonstrates a relationship between TWO management techniques and the increase in product quality	4
• Demonstrates a relationship between a management technique and the increase in product quality AND identifies another management technique	3
• Outlines TWO management techniques which can improve quality	2
• Outlines a management technique which can improve quality	1

Sample answer:*Milk*

To improve the quality of milk, as measured by butterfat percentage, a farmer can increase the numbers of Jersey cattle in the herd as they produce milk with a higher butterfat percentage.

Another way is to feed the animals more fibre. Fibre digestion in the rumen produces volatile fatty acids, which the cow converts to fat so therefore increasing butterfat percentage in the milk.

Question 26 (c)

Criteria	Marks
• Describes ways the product can be <i>value added</i>	4
• Describes a way the product can be <i>value added</i>	3
• Outlines a way the product can be <i>value added</i>	2
• Identifies a way the product can be <i>value added</i>	1

Sample answer:

Cheese is produced from milk by introducing rennet and a culture into the milk. The resulting curd is then pressed and dried to form the cheese.

Cream is produced from milk by separating the milk fat in a machine called a separator. The result is cream and skim milk.

Question 27 (a)

Criteria	Marks
<ul style="list-style-type: none"> Provides characteristics and features of a negative effect of a named pest or disease on the marketing of a plant or animal product 	3
<ul style="list-style-type: none"> Sketches in general terms a negative effect of a named pest or disease on the marketing of a plant or animal product 	2
<ul style="list-style-type: none"> Identifies an appropriate plant/animal pest or disease or a negative effect 	1

Sample answer:

Mastitis is a bacterial infection of the udder. If a dairy cow contracts mastitis the milk cannot be sold for human consumption. The presence of the pathogen changes the quality of the milk. Milk with high cell counts will be rejected at the processing factory.

Question 27 (b)

Criteria	Marks
<ul style="list-style-type: none"> Demonstrates a clear relationship between the strategy that is used to control a specific pest/disease problem and how it addresses both environmental AND economic sustainability 	6
<ul style="list-style-type: none"> Demonstrates a relationship between the strategy that is used to control a specific pest/disease problem and how it addresses both environmental AND economic sustainability 	5
<ul style="list-style-type: none"> Demonstrates a relationship between the strategy that is used to control a specific pest/disease problem and how it addresses either environmental OR economic sustainability AND addresses the other issue 	3–4
<ul style="list-style-type: none"> Provides some characteristics and features of the strategy related to either issue 	2
<ul style="list-style-type: none"> Makes a relevant point 	1

Sample answer:

Helicoverpa is a major pest of cotton. One control strategy is genetic modification of the plant – cotton plants have been modified to produce bacterial toxins that kill the Helicoverpa caterpillar eg Bt cotton. This means fewer chemicals are used therefore the higher cost of GMO seed used is more than offset by the reduction in chemical use. It is more environmentally friendly as it reduces pesticide resistance in the target organism as well as reducing chemical contamination.

Section II

Question 28 (a) (i)

Criteria	Marks
• Outlines benefits of the use of genetically modified organisms	3
• Outlines a benefit of the use of genetically modified organisms	2
• Makes a relevant point	1

Sample answer:

Genetically modified organisms can have a resistance gene incorporated in them to avoid the effects of insect damage.

A gene to increase the nutritional value of a food can increase vitamin supply to people who eat the crop.

Question 28 (a) (ii)

Criteria	Marks
• Provides detailed features of the regulation of the development or use of GMOs in Australia	5
• Provides features of the regulation of the development or use of GMOs	4
• Provides a feature of the regulation of the development or use of GMOs	3
• Outlines the regulation of GMOs	2
• Identifies a relevant point or example	1

Sample answer:

GMO development and use in Australia are controlled by the regulator – Gene Technology Regulator – under the *Gene Technology Act 2000*. There is an integrated legislative framework involving other agencies such as FSANZ (food), APVMA (Ag and vet chemicals) and AQIS (quarantine and imports).

The regulator controls the licensing of experimental work (development) and propagation, culture, transport, use and disposal of GM products. Other aspects such as food labelling and importation are also covered under the Act and Regulations.

Question 28 (b)

Criteria	Marks
<ul style="list-style-type: none"> Provides clear and detailed judgement relating to biofuel production and the world demand for food and sustainable carbon use Provides a logical and cohesive response Uses relevant and current examples 	10–12
<ul style="list-style-type: none"> Provides some judgement relating to biofuel production and the world demand for food and sustainable carbon use Provides a mostly logical and cohesive response Includes an example 	7–9
<ul style="list-style-type: none"> Describes biofuel production in relation to the world demand for food OR sustainable carbon use Provides an organised response Identifies an example 	4–6
<ul style="list-style-type: none"> Outlines biofuel production OR <ul style="list-style-type: none"> Provides some relevant information 	1–3

Answers could include:

- Use of biofuels vs non-renewable fossil fuels
- Issues of subsidies and biofuel production
- Conflict between using crops for animal production and human consumption
- Resources (land, water) being used for biofuel production
- Use of fossil fuels (carbon emissions) in biofuel production
- Destruction of ecosystems to meet the needs for biofuel production.

Question 29 (a) (i)

Criteria	Marks
• Outlines THREE sources of greenhouse gases from agricultural systems	3
• Outlines TWO sources of greenhouse gases from agricultural systems	2
• Outlines a source of greenhouse gas from agricultural systems OR • Identifies TWO or more greenhouse gases	1

Sample answer:

Carbon dioxide emissions from agricultural systems are mainly from the use of fossil fuels in agricultural machinery.

Methane is produced in large quantities by ruminant livestock and also from the breakdown of organic matter in waterlogged and disturbed soils.

Nitrogen dioxide is produced by the de-nitrification of nitrogenous fertiliser in soils.

Question 29 (a) (ii)

Criteria	Marks
• Provides a comprehensive description of how a farmer can reduce the emissions of the THREE greenhouse gases	5
• Provides a description of how a farmer can reduce the emissions of the greenhouse gases	4
• Outlines how a farmer can reduce the emissions of the greenhouse gases	3
• Identifies ways a farmer can reduce the emissions of greenhouse gas	2
• Makes a relevant point	1

Sample answer:

Each greenhouse gas emission is reduced in very different ways.

Carbon dioxide emissions from farm machines can be reduced by using them less. A method of reducing machinery usage is to use passes over a paddock, such as employing minimum tillage machinery, and utilising herbicides for weed control. Another advantage of this is that a reduction in tillage causes a that a reduction in the losses of soil organic matter, which when lost is emitted as carbon dioxide.

Nitrous oxide emissions can be reduced by applying nitrogen fertiliser to soils in appropriate concentrations, and avoiding application to waterlogged soils.

Ruminant livestock emit methane as a by-product of their rumen processes. This can be reduced by changing the diet to include carbohydrates, pelleting or chopping the feed. Another method is dietary additives such as antibiotics or seaweed.

Question 29 (b)

Criteria	Marks
<ul style="list-style-type: none"> Provides comprehensive relationships between La Niña, El Niño and changes in the SOI and crop yield in eastern Australia Provides a logical and cohesive response Uses relevant and current examples 	10–12
<ul style="list-style-type: none"> Provides relationships between La Niña, El Niño and changes in the SOI and crop yield in eastern Australia Provides a mostly logical and cohesive response Includes an example 	7–9
<ul style="list-style-type: none"> Describes La Niña, El Niño and changes in the SOI OR describes influences on crop yield in eastern Australia Provides an organised response Uses some examples 	4–6
<ul style="list-style-type: none"> Demonstrates limited knowledge of climate variability and/or crop yield in eastern Australia <p>OR</p> <ul style="list-style-type: none"> Provides some relevant information 	1–3

Answers could include:

- La Niña can influence climate to increase rainfall, decrease max temperature, decrease frosts, increase cyclones and cause monsoons earlier.
- El Niño can influence climate to decrease rainfall, increase max temperatures, increase frosts, decrease cyclones, increase fire danger in south-east Australia, cause monsoon season to be delayed.
- SOI changes measure the development of intensity of El Niño (SOI below –7) and La Niña (SOI +7).
- Crop yield changes relative to changes in key factors influenced by El Niño and La Niña such as rainfall, temperatures, extremes of temperature, frost and cyclone incidence.

Question 30 (a) (i)

Criteria	Marks
<ul style="list-style-type: none"> Outlines benefits of plant breeder rights for a plant breeder or grower 	3
<ul style="list-style-type: none"> Outlines a benefit of plant breeder rights for a plant breeder or grower 	2
<ul style="list-style-type: none"> Provides some relevant information 	1

Sample answer:

Plant breeders' rights protect the right of the plant breeder to gain royalties (income) from the sale of seed or propagating material. Provides a commercial monopoly for a period of 20 to 25 years.

Question 30 (a) (ii)

Criteria	Marks
• Provides detailed reasons why new technologies are adopted by farmers	5
• Provides reasons why new technologies are adopted by farmers	4
• Outlines a reason why new technologies are adopted by farmers OR • Identifies reasons why new technologies are adopted by farmers	2–3
• Makes a relevant point	1

Sample answer:

New technologies can replace labour which is often unreliable, unavailable and always a significant cost to the farmer. This can improve the profitability of the farm.

New technologies can also improve the efficiency of operations. The GPS system reduces overlapping when spraying, ploughing or seeding so reducing input costs of seed chemical, fuel and fertiliser. An additional benefit is a saving of labour time and costs.

Question 30 (b)

Criteria	Marks
• Provides clear and detailed advantages and/or disadvantages of recent developments in the use of robotics in agricultural production • Provides a logical and cohesive response • Uses relevant and recent examples	10–12
• Provides some advantages and/or disadvantages of recent developments in the use of robotics in agricultural production • Provides a mostly logical and cohesive response • Includes an example	7–9
• Describes some development in the use of robotics in agricultural production • Provides an organised response • Identifies an example	4–6
• Outlines a recent development in the use of robotics in agricultural production OR • Provides some relevant information	1–3

Answers could include:

- Aspects of robotics in terms of sense ... decision ... response or control
- Weeding robots
- Robotic milking
- Smart scales and livestock drafting
- Smart gates
- Greenhouse climate control systems
- Horticultural planting robots.

2018 HSC Agriculture Mapping Grid

Section I Part A

Question	Marks	Content	Syllabus outcomes
1	1	Soil chemical characteristics	H1.1
2	1	Phases of growth of a plant	H2.1
3	1	Marketing strategies	H3.2
4	1	Microbes and decomposition	H1.1
5	1	Soil physical characteristics	H1.1
6	1	Proportion of bone, muscle, fat	H2.2
7	1	Pasture types	H2.1
8	1	Ruminant digestion	H2.1
9	1	Value adding of a product	H3.1
10	1	Integrated pest management	H1.1
11	1	Water sources on farms	H1.1
12	1	Light experiment	H4.1
13	1	Plant hormones	H2.1
14	1	Animal hormones	H2.2
15	1	Formulating feed rations	H2.2
16	1	Plant breeding	H2.1
17	1	Land classification/capability	H1.1
18	1	Gross margins	H3.1
19	1	Government influence	H3.1
20	1	Objective measurement	H2.2

Section I Part B

Question	Marks	Content	Syllabus outcomes
21 (a)	2	Plant nutrients – page 19	H2.1
21 (b)	2	Crop rotations – page 21	H2.1
21 (c)	4	Soil degradation – page 20	H2.1
22 (a)	4	Plant competition – page 21	H2.1
22 (b)	4	Temperature and plant production – page 22	H3.4
23 (a)	3	Product supply – page 26	H3.1
23 (b)	6	Product demand – page 26	H3.1
24	6	Animal breeding technologies – pages 23–24	H2.2, H3.3, H3.4, H5.1
25 (a)	4	Experimental design – page 24	H4.1
25 (b)	4	Experimental design – page 24	H4.1
25 (c)	2	Experimental result analysis – page 24	H4.1
26 (a)	2	Product criteria – page 26	H3.2

Question	Marks	Content	Syllabus outcomes
26 (b)	4	Product quality – page 26	H3.4
26 (c)	4	Value adding – page 26	H3.2
27 (a)	3	Plant/animal pest or disease – pages 22–23	H2.1, H2.2
27 (b)	6	Sustainable pest/disease control – pages 22–23	H2.1, H2.2, H3.4

Section II

Question	Marks	Content	Syllabus outcomes
28 (a) (i)	3	Definition of GMO – page 27	H5.1
28 (a) (ii)	5	GMO regulation – page 27	H5.1
28 (b)	12	Biofuel production – page 28	H5.1
29 (a) (i)	3	Greenhouse gas sources – page 30	H5.1
29 (a) (ii)	5	Greenhouse gas emission reduction – page 30	H3.4
29 (b)	12	Climate variability/crop yield – page 30	H5.1
30 (a) (i)	3	Plant breeder rights – page 32	H5.1
30 (a) (ii)	5	Adopting technology – page 33	H3.4
30 (b)	12	Application of robotics – page 32	H5.1