# 2017 HSC Agriculture Marking Guidelines

## Section I, Part A

### Multiple-choice Answer Key

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

# Section I, Part B

## Question 21 (a)

| Criteria | Marks |
|---|---|
| • Outlines two methods of standardisation | 2 |
| • Outlines one method of standardisation | 1 |

***Sample answer:***

In our trial standardisation was achieved by using the same type of plants and the same sized pots to grow them under different light conditions.

***Answers could include:***

- Same watering regime
- Same potting mix/soil
- Same type and quantity of fertiliser
- Same weed/pest control techniques.

## Question 21 (b)

| Criteria | Marks |
|---|---|
| • Describes an appropriate trial that incorporates evidence of a control, standardisation, randomisation and replication | 4 |
| • Describes a trial that incorporates three of the above experimental design features | 3 |
| • Describes a trial that incorporates two of the above experimental design features | 2 |
| • Describes a trial that incorporates one of the above experimental design features | 1 |

***Sample answer:***

1. Select a suitable area of land, which has uniform soil, slope and light conditions.
2. Divide the area into ten same-sized plots.
3. Plant five randomly chosen plots with the new variety and five with a currently used one. Ensure that each plot is planted at the same time, same density, given the same type and amount of fertiliser and receives the same watering regime.

***Answers could include:***

A suitably designed pot trial.

## Question 22 (a)

| Criteria | Marks |
|---|---|
| • Outlines beneficial roles of microbes in soils | 3 |
| • Outlines a beneficial role of microbes in soils | 2 |
| • Identifies a beneficial role(s) of microbes in soils | 1 |

***Sample answer:***

Microbes play a role in the breakdown of plant and animal remains into organic matter in soils. They release humus into the soil and also release plant nutrients, which plants can take up through their roots.

One group of microbes is able to fix nitrogen from the atmosphere and make nitrogen compounds available to plants.

***Answers could include:***

- Mycorrhiza
- Rhizosphere microbes
- Breakdown of toxins.

## Question 22 (b)

| Criteria | Marks |
|---|---|
| • Provides a link between two soil management techniques and how they increase the population of microbes | 4 |
| • Provides a link between a soil management techniques and how it increases the population of microbes AND outlines another relevant soil management strategy | 3 |
| • Provides a link between a soil management technique and how it increases the population of microbes OR outlines TWO relevant soil management techniques | 2 |
| • Identifies a relevant soil management technique(s) | 1 |

***Sample answer:***

Stubble retention and green manuring both result in an increase in the level of soil organic matter (soil carbon). The increased organic matter content of the soil results in an increase in the amount of nutrition available to microbes and invertebrates thus allowing their populations to increase.

***Answers could include:***

- Reduced tillage
- Addition of animal manures
- Reduction in chemical application
- Use of pasture leys
- Liming of soil
- Inoculation of legumes.

## Question 23 (a)

| Criteria | Marks |
|---|---|
| • Outlines three or more phases of growth of a named plant | 3 |
| • Outlines two phases of growth of a named plant | 2 |
| • Identifies a phase(s) of growth of a named plant | 1 |

***Sample answer:***

During the vegetative stages of the growth of a corn plant the roots and leaves are formed. Following this the flowering structures (silks and tassels) form and the grains develop in the cob. This is known as the reproductive phase. The maturation phase, when the grains ripen and the plant dies, then follows.

***Answers could include:***

A description of the phases of growth of any agricultural plant.

## Question 23 (b)

| Criteria | Marks |
|---|---|
| • Clearly links reasons for the increase and decrease in yield with an increasingly dense plant population | 4 |
| • Clearly links a reason for the increase or decrease in yield with an increasingly dense plant population AND identifies a reason for the other | 3 |
| • Clearly links a reason for the increase or decrease in yield with an increasingly dense plant population<br>OR<br>• Identifies reasons for the increase and decrease in yield with an increasingly dense plant population | 2 |
| • Identifies a reason for the increase or decrease in yield with an increasingly dense plant population | 1 |

***Sample answer:***

Up until the point at which the yield begins to fall the increased plant density more than compensates for the reduced yield per plant. Hence total yield per hectare continues to increase until this point.

At the point where yield per hectare begins to fall, the intense competition between the plants results in many of them not developing to maturity. Hence, at densities beyond this, total yield per hectare falls.

## Question 23 (c)

| Criteria | Marks |
|---|---|
| • Explains an advantage AND a disadvantage of a method of improving soil moisture | 4 |
| • Explains an advantage AND identifies a disadvantage of a method of improving soil moisture<br>OR<br>• Explains a disadvantage AND identifies an advantage of a method of improving soil moisture | 3 |
| • Identifies an advantage AND a disadvantage of a method of improving soil moisture<br>OR<br>• Explains an advantage OR a disadvantage of a method of improving soil moisture | 2 |
| • Identifies an advantage OR a disadvantage of a method of improving soil moisture | 1 |

***Sample answer:***

Available soil moisture can be manipulated by irrigating the crop. The advantage is that this is a very effective technique for regulating the amount of water according to the needs of the plant. It is only appropriate for crops where there is a suitable source of water available (for example, dams and rivers) and the topography is suitable. A disadvantage is that excessive irrigation can cause water tables to rise, which can cause salinity problems.

***Answers could include:***

- Mulching
- Fallowing
- Soil structural modification (eg gypsum)
- Addition of compost
- Stubble retention.

## Question 24 (a)

| Criteria | Marks |
|---|---|
| • Identifies two factors affecting fertility in farm animals | 2 |
| • Identifies a factor affecting fertility in farm animals | 1 |

***Sample answer:***

- nutrition
- genetics.

***Answers could include:***

- pests/diseases
- age of the animal
- temperature
- day length
- management.

## Question 24 (b)

| Criteria | Marks |
|---|---|
| • Provides a clear link between a management strategy and improved reproductive performance of livestock | 3 |
| • Describes a management strategy which improves the reproductive performance of livestock | 2 |
| • Identifies a management strategy which improves the reproductive performance of livestock | 1 |

***Sample answer:***

Flushing is a technique which can improve the fertility of farm animals. Placing the animals on a rising plane of nutrition prior to mating causes an improvement in body condition. This in turn will stimulate ovulation in female animals, thus improving fertility.

***Answers could include:***

- Age structure of herd/flock
- Keeping male animals cool.

## Question 24 (c)

| Criteria | Marks |
|---|---|
| • Comprehensively shows the differences between TWO breeding systems used in livestock production | 6 |
| • Describes the differences between TWO breeding systems used in livestock production | 4–5 |
| • Outlines TWO breeding systems used in livestock production | 2–3 |
| • Identifies a breeding system | 1 |

***Sample answer:***

Two breeding systems used in livestock production are selective breeding and cross-breeding.

In selective breeding, males (but also female animals) that show superior characteristics within a breed, are selected. These animals become the parents of the next generation. This system produces animals which have similar characteristics (same breed) but also has the disadvantage of producing some inbreeding. The structure of a commercial herd is easy to maintain as all animals can be breeding herd replacements and also used for slaughter.

Cross-breeding uses two different breeds of animal to produce a very uniform cross-bred progeny. Unlike selective breeding this system has no risk of inbreeding.

The maintenance of the herd is difficult as replacement breeding stock must be obtained from outside the cross-breeding herd. This is less of an issue for selective breeding.

## Question 25

| Criteria | Marks |
|---|---|
| • Comprehensively evaluates an IPM program for the named pest/disease in terms of environmental impact, economic factors AND resistance to pesticides | 6 |
| • Comprehensively evaluates an IPM program for the named pest/disease in terms of environmental impact AND/OR economic factors AND/OR resistance to pesticides | 4–5 |
| • Describes a relevant IPM program<br>OR<br>• Outlines an IPM program | 2–3 |
| • Makes a relevant point | 1 |

***Sample answer:***

An IPM program for managing Barber's Pole Worm in sheep includes:

- monitoring worm burdens in the flock by faecal egg testing
- strategic use of drenches when worm numbers build up in the flock
- selection of sheep showing resistance to worms for breeding
- quarantining new sheep on arrival on a property
- moving sheep to fresh pastures after drenching.

Economically such a program will help reduce costs by limiting drench usage. There will also be lower rates of re-infestation and natural resistance in the flock will increase. Stock losses should also decrease. There will, however, be additional costs associated with faecal egg testing. Overall, however, such a program should be economically advantageous.

This program will also reduce the build-up of resistance to drenches by the worms. This is due to less reliance on drenches because of the lower rates of re-infection and the increase in sheep resistance to the worms. Hence, the effectiveness of drenches is prolonged.

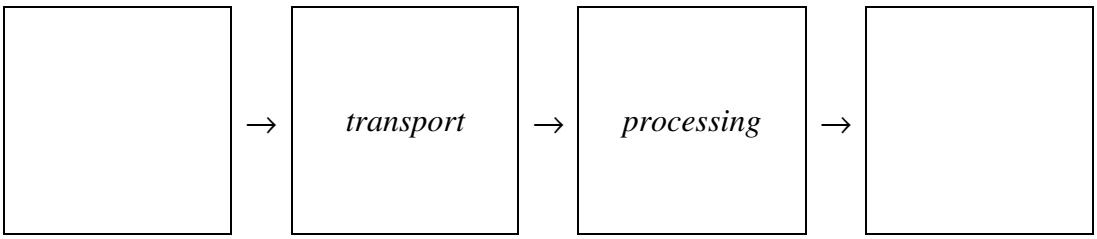
The reduction in the usage of chemicals will reduce environmental impacts as less drench is released in the manure, affecting the dung beetles and other soil life.

The reduction in the usage of chemicals will reduce environmental impacts by lowering the amount of chemical residues entering the soil via animal manure.

## Question 26 (a)

| Criteria | Marks |
|---|---|
| • Identifies two marketing chain steps in the correct order | 2 |
| • Identifies one relevant step OR two steps in reverse order | 1 |

***Sample answer:***




## Question 26 (b)

| Criteria | Marks |
|---|---|
| • Describes ways in which governments can influence the production OR marketing of the named farm product | 4 |
| • Describes a way in which governments can influence the production OR marketing of the named farm product AND outlines another way | 3 |
| • Outlines ways in which governments can influence the production OR marketing of the named product<br>OR<br>• Describes a way in which governments can influence the production OR marketing of the named product | 2 |
| • Identifies a way in which governments can influence the production OR marketing of the named product | 1 |

***Sample answer:***

Named product: Milk

Government-imposed health regulations preclude the sale of raw milk for human consumption in NSW. Hence processors must treat milk before it can be legally sold for human consumption.

When producing milk, farmers must also comply with environmental legislation relating to pollution of waterways with runoff from their farms.

***Answers could include:***

- WHS legislation
- Industry codes of practice.

## Question 26 (c)

| Criteria | Marks |
|---|---|
| • Provides a comprehensive explanation of how the named product can be value added | 6 |
| • Provides an explanation of how the named product can be value added | 4–5 |
| • Describes how the named product can be value added | 2–3 |
| • Identifies how the named product can be value added | 1 |

***Sample answer:***

A dairy farmer can add value to milk by investing in a processing plant to convert raw milk into another product such as milk packaged for consumption, cheese or yoghurt. This allows the farmer to market these products directly and increase farm income as these products have a higher value than raw milk. A large capital outlay may be needed to do this but it has proved to be a successful and profitable initiative for many farmers.

Dairy factories process raw milk into a wide range of consumer products such as low fat milk, skim milk and cream. This benefits the dairy industry as a whole by increasing sales of raw milk from farms. The processor also benefits as profits are increased from the sales of the manufactured products.

## Question 27 (a)

| Criteria | Marks |
|---|---|
| • Provides THREE correct calculations | 3 |
| • Provides TWO correct calculations | 2 |
| • Provides ONE correct calculations | 1 |

***Sample answer:***

| | |
|---|---|
| Variable costs | $21 560.00 |
| Total gross margin | $41 640.00 |
| Gross margin per hectare | $237.94 |

## Question 27 (b)

| Criteria | Marks |
|---|---|
| • Explains changes in business structures which may have led to decreases in the number of farms and increased production | 4 |
| • Describes changes in business structures which may have led to decreases in the number of farms and increased production | 3 |
| • Outlines changes in business structures which may have led to decreases in the number of farms and/or increased production | 2 |
| • Identifies a change in business structures which may have led to decreases in the number of farms and/or increased production | 1 |

***Sample answer:***

The second graph indicates that farms in Australia have become larger and/or more productive. Corporate farms that are owned by large investment companies can afford to invest in technology and capital equipment or purchase more land in order to increase production. Smaller family farmers may purchase neighbouring properties and increase the scale of their enterprise. This leads to an increase in efficiency and a reduction in the total number of farms.

# Section II

## Question 28 (a) (i)

| Criteria | Marks |
|---|---|
| • Outlines the importance of both food safety and labelling related to GMOs | 3 |
| • Outlines the importance of either food safety OR labelling related to GMOs | 2 |
| • Makes a relevant point | 1 |

***Sample answer:***

Safety checks need to be performed on foods derived from GMOs to ensure that they are not toxic in any way and do not cause allergic reactions in consumers.

Labelling of foods that contain GMOs is important to make consumers aware of their presence and to allow them to make their own choices about consuming them.

## Question 28 (a) (ii)

| Criteria | Marks |
|---|---|
| • Describes current developments in TWO of the biotechnologies listed | 5 |
| • Describes current developments in ONE of the biotechnologies listed AND outlines another one | 4 |
| • Describes current developments in ONE of the biotechnologies listed | 3 |
| • Outlines two of the biotechnologies listed | 2 |
| • Outlines one of the biotechnologies listed | 1 |

***Sample answer:***

There are a range of developments in biotechnology which are making agricultural production more effective, efficient and environmentally friendly.

Biofuels are derived from material such as plant and animal matter. Sugar cane juice can be fermented to produce ethanol. Oils from canola can be extracted and used as diesel fuel.

Biopesticides are derived from naturally occurring products or living organisms and are used to kill or repel pests. An example is the use of pheromones to confuse pests and prevent them from breeding. Viruses of pests can be multiplied and used as a targeted method to kill pests.

**Question 28 (b)**

| Criteria | Marks |
|---|---|
| • Discusses the use of genetically modified crops in agricultural production<br>• Provides a logical and cohesive response<br>• Uses relevant and current examples to support the answer | 10–12 |
| • Describes the use of genetically modified crops in agricultural production<br>• Provides a mostly logical and cohesive response<br>• Uses relevant and current examples | 7–9 |
| • Outlines the use of genetically modified crops in agricultural production<br>• Provides an organised response<br>• Uses some examples | 4–6 |
| • Demonstrates limited knowledge of genetically modified crops | 1–3 |

***Answers could include:***

- Pest tolerance/resistance
- Herbicide tolerance
- High yields
- Risk of gene transfer to other species
- Consumer resistance
- Increased use of herbicides
- Bt cotton
- 'Round-up Ready' canola.

**Question 29 (a) (i)**

| Criteria | Marks |
|---|---|
| • Explains the processes which lead to identified greenhouse gases being released from nitrogen fertilisers AND intensive ruminant production | 4 |
| • Explains the processes which lead to identified greenhouse gases being released from nitrogen fertilisers OR intensive ruminant production | 3 |
| • Identifies greenhouse gases being released from nitrogen fertilisers AND intensive ruminant production | 2 |
| • Identifies greenhouse gases being released from nitrogen fertilisers OR intensive ruminant production | 1 |

***Sample answer:***

In waterlogged soils nitrogen fertilisers can be converted into nitrous oxides by microbial actions and are released into the atmosphere.

Intensive ruminant production systems, such as beef cattle feedlots, increase the production of methane and carbon dioxide in the rumen of the animals. These gases are released into the atmosphere when the animals burp.

Nitrous oxides, carbon dioxide and methane are all known as greenhouse gases.

## Question 29 (a) (ii)

| Criteria | Marks |
|---|---|
| • Describes in detail the evidence linking greenhouse gases and climate change | 4 |
| • Outlines the evidence linking greenhouse gases and climate change | 3 |
| • Identifies two pieces of evidence linking greenhouse gases and climate change | 2 |
| • Identifies one piece of evidence linking greenhouse gases and climate change | 1 |

***Sample answer:***

Evidence supporting the view that increased greenhouse gases cause climate change is based on the collection of information from current and also historical sources.

The weather records, especially average temperatures over the past 100 years are closely correlated with the levels of greenhouse gases – especially $CO_2$ – in the atmosphere.

Historical information from air bubbles trapped in deep ice cores can show long-term changes in atmospheric gas composition. This is also very closely correlated with the climatic effects on plant growth shown in tree rings.

***Answers could include:***

- Correlation between greenhouse gas levels and temperature increases (atmospheric and sea water)
- Ice core evidence
- Tree growth ring evidence
- Experimental data
- Climate modeling.

## Question 29 (b)

| Criteria | Marks |
|---|---|
| • Discusses issues relating to water storage AND water trading which may affect Australian agriculture in a changing climate<br>• Provides a logical and cohesive response<br>• Uses relevant and current examples to support the answer | 10–12 |
| • Describes issues relating to water storage AND water trading which may affect Australian agriculture in a changing climate<br>• Provides a mostly logical and cohesive response<br>• Uses relevant and current examples | 7–9 |
| • Outlines issues relating to water storage AND/OR water trading which may affect Australian agriculture in a changing climate<br>• Provides an organised response<br>• Uses some examples | 4–6 |
| • Demonstrates limited knowledge of the issues relating to water storage OR water trading | 1–3 |

***Answers could include:***

- Covering dams
- Deeper dams
- Construction of more dams
- Aquifer usage and depletion
- Impact on wetlands
- Recreational use of waterways
- Over-allocation of irrigation water
- Irrigation licences.

## Question 30 (a) (i)

| Criteria | Marks |
|---|---|
| • Clearly outlines issues relating to the development of a new farming technology | 4 |
| • Clearly outlines an issue relating to the development of a new farming technology AND identifies a second issue | 3 |
| • Clearly outlines an issue relating to the development of a new farming technology<br>OR<br>• Identifies two issues relating to the development of a new farming technology | 2 |
| • Identifies an issue relating to the development of a new farming technology | 1 |

***Sample answer:***

When an idea for a new technology is being researched a number of factors will need to be considered.

The funding for the research will be an important issue. Funding can be sourced from potential commercial partners, industry bodies, government research grants or from universities.

If a new technology interacts with animals the welfare implications of the technology on animals will need to be considered even in the initial research of the technology.

***Answers could include:***

- needs of agricultural producers
- technological ability of potential users
- ease of use by farmers
- the serviceability and reliability of the technology in the field conditions.

## Question 30 (b)

| Criteria | Marks |
|---|---|
| • Provides comprehensive points for and/or against the usefulness of recent developments in specific satellite technologies in agricultural production<br>• Provides a logical and cohesive response<br>• Uses relevant and current examples to support the answer | 10–12 |
| • Provides some points for and/or against the usefulness of recent developments in specific satellite technologies in agricultural production<br>• Provides a mostly logical and cohesive response<br>• Uses relevant and current examples | 7–9 |
| • Outlines the use of satellite technologies in agricultural production<br>• Provides an organised response<br>• Uses some examples | 4–6 |
| • Demonstrates limited knowledge of the use of satellite technologies in agricultural production | 1–3 |

***Answers could include:***

Use of GPS technology for:

- accurate seeding of crops
- navigation of farm robots
- self-steered tractors
- reduced traffic for cultivation
- tracking of animals.

Use of Remote Sensing Satellites (Landsat) to:

- estimate yield
- identify pest/disease outcrops
- identify nutrient deficiencies and/or water logging.

Use of weather satellites to:

- forecast weather changes
- predict severe weather events.

# 2017 HSC Agriculture
# Mapping Grid

**Section I**
**Part A**

| Question | Marks | Content | Syllabus outcomes |
|---|---|---|---|
| 1 | 1 | Ruminant nutrition | H2.2 |
| 2 | 1 | Historical land use practices – pages 20 and 22 | H1.1 |
| 3 | 1 | Water quality changes – page 20 | H1.1 |
| 4 | 1 | Pasture diversity – page 21 | H2.1 |
| 5 | 1 | Interpret pesticide label – page 22 | H2.1 |
| 6 | 1 | Whole farm planning – page 20 | H1.1 |
| 7 | 1 | Soil physical characteristics – page 19 | H1.1 |
| 8 | 1 | Physical/chemical features of soils – page 19 | H1.1 |
| 9 | 1 | Collection/analysis of data – page 24 | H4.1 |
| 10 | 1 | Animal breeding systems – page 23 | H2.2 |
| 11 | 1 | Ruminant/monogastric digestion – page 22 | H2.2 |
| 12 | 1 | Sources of water – page 20 | H1.1 |
| 13 | 1 | Market reports – page 26 | H3.1 |
| 14 | 1 | Constraints on plants – page 21 | H1.1 |
| 15 | 1 | Plant breeding systems – page 22 | H2.1 |
| 16 | 1 | Analysing financial situation – page 25 | H3.1 |
| 17 | 1 | Animal reproductive techniques – page 23 | H2.2 |
| 18 | 1 | Responsible use of chemicals – page 22 | H2.2 |
| 19 | 1 | Plant hormones – page 21 | H2.1 |
| 20 | 1 | Design a ration – page 22 | H2.2 |

**Section I**
**Part B**

| Question | Marks | Content | Syllabus outcomes |
|---|---|---|---|
| 21 (a) | 2 | Experimental design – page 24 | H4.1 |
| 21 (b) | 4 | Experimental design – page 24 | H4.1 |
| 22 (a) | 3 | Role of microbes – page 19 | H1.1 |
| 22 (b) | 4 | Managing soil fertility – page 20 | H1.1 |
| 23 (a) | 3 | Stages of plant growth – page 21 | H2.1 |
| 23 (b) | 4 | Plant competition – page 21 | H2.1 |
| 23 (c) | 4 | Environmental constraints – page 21 | H2.1 |
| 24 (a) | 2 | Animal fertility – page 23 | H2.2 |
| 24 (b) | 3 | Animal reproduction – page 23 | H2.2 |
| 24 (c) | 6 | Animal breeding systems – page 23 | H2.2 |
| 25 | 6 | IPM program – page 22 | H2.1 |
| 26 (a) | 2 | Farm product study – page 26 | H3.1 |

| Question | Marks | Content | Syllabus outcomes |
|---|---|---|---|
| 26 (b) | 4 | Government intervention – page 26 | H3.1 |
| 26 (c) | 6 | Value adding – page 26 | H3.1 |
| 27 (a) | 3 | Gross margin analysis – page 25 | H3.1 |
| 27 (b) | 4 | Farm business structures – page 25 | H3.1 |

**Section II**

| Question | Marks | Content | Syllabus outcomes |
|---|---|---|---|
| 28 (a) (i) | 3 | Food safety and labelling – page 27 | H3.4 |
| 28 (a) (ii) | 5 | Biotechnology – page 28 | H5.1 |
| 28 (b) | 12 | Biotechnology – page 28 | H5.1 |
| 29 (a) (i) | 4 | Nitrogen fertilisers and intensive animal production – page 30 | H3.4 |
| 29 (a) (ii) | 4 | Greenhouse gases – page 30 | H3.4 |
| 29 (b) | 12 | Managing resources – page 30 | H3.4 |
| 30 (a) (i) | 4 | New technologies – page 32 | H5.1 |
| 30 (a) (ii) | 4 | Marketing technology – page 32 | H3.4 |
| 30 (b) | 12 | Satellite technologies – page 32 | H5.1 |