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# 2023 HSC Agriculture Marking Guidelines

## Section I, Part A

### Multiple-choice Answer Key

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

## Section I, Part B

### Question 21 (a) (i)

Criteria	Marks
<ul style="list-style-type: none"> <li>Identifies the nutrient</li> </ul>	1

**Sample answer:**

Carbon or C

### Question 21 (a) (ii)

Criteria	Marks
<ul style="list-style-type: none"> <li>Outlines the role of soil nutrient cycles in agriculture</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

The role of nutrient cycles in agriculture is to move nutrients through the ecosystem using various processes between soil, air, water and living things.

### Question 21 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Describes the importance of invertebrates in decomposition and nutrient cycling</li> </ul>	3
<ul style="list-style-type: none"> <li>Describes the importance of invertebrates in decomposition or nutrient cycling</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>Outlines the importance of invertebrates in decomposition and/or nutrient cycling</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

Invertebrates help to decompose dead animals, plant matter and manure by physical breakdown of the material and moving the organic components around and into the soil. Invertebrates help to move material from the surface into the soil by pulling it into the cracks or burrows breaking it down into smaller pieces and increasing the surface. This allows microbes to access it, decompose and cycle nutrients making them available for plant growth.

### Question 22 (a)

Criteria	Marks
• Outlines TWO influences of government on production and marketing of a product	3
• Outlines ONE influence of government on production and/or marketing of a product	2
• Provides some relevant information	1

**Sample answer:**

Governments can provide low-cost loans which exist to assist disaster recovery such as from droughts, fires and floods and are overseen by the Rural Assistance Authority. The aim is to help producers get back on their feet with either deferred interest or low-cost interest loans. Most industries pay a levy at marketing, matched by government, to fund research, development and extension.

### Question 22 (b)

Criteria	Marks
• Justifies thoroughly marketing options that could be used for a named farm product	5
• Justifies one marketing option, and describes another, that could be used for a named product	4
• Describes marketing option(s) that could be used for a named farm product	3
• Outlines marketing option(s) that could be used for a product	2
• Provides some relevant information	1

**Sample answer:**

Marketing weaner cattle directly from a paddock via Auctionplus allows for less stress and weight loss to the weaner cattle. Weaners are preweighed and assessed by a stock agent with a reserve price set on the box, so buyers know what they are getting and allows better biosecurity management.

Selling weaners directly to a saleyard can often be a preferred method for smaller lots of cattle, especially in a rising market where a vendor may benefit from a competitive market and achieve a better price. It can be more stressful on the weaner cattle and set back any weight gain more so than selling directly out of a paddock with Auctionplus.

**Answers could include:**

- Domestic vs export
- Fresh vs processed
- Contract vs farmgate etc.

### Question 23 (a)

Criteria	Marks
• Demonstrates an understanding of the importance of a named market specification	2
• Provides some relevant information	1

**Sample answer:**

Micron is very important in determining wool quality and meeting AWEX specifications as it influences the criteria required for being classed as superfine, fine, medium or strong wool.

### Question 23 (b)

Criteria	Marks
• Provides a sound explanation of how scheduling the timing of a named operation during production contributes to meeting a named market specification	4
• Provides an explanation of how the timing of a named operation during production contributes to meeting a named market specification	3
• Describes how timing of an operation contributes to meet market specifications	2
• Provides some relevant information	1

**Sample answer:**

Timing of shearing sheep can impact wool quality especially vegetative matter content (VM%) in a merino fleece. If shorn before summer seed set of grasses, the fleece will have lower VM% and thus receive better AWEX value and price. Shearing time allows a lower VM score which helps producers reach a specific wool market target and a premium price.

### Question 23 (c)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a comprehensive justification of one management strategy, other than timing, that can be used to meet a named market specification</li> </ul>	6
<ul style="list-style-type: none"> <li>Provides some justification of one management strategy, other than timing, that can be used to meet a named market specification</li> </ul>	5
<ul style="list-style-type: none"> <li>Describes how one management strategy, other than timing, that can be used to meet market specifications</li> </ul>	4
<ul style="list-style-type: none"> <li>Demonstrates some understanding of a management strategy that can be used to meet market specifications</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

Nutrition is very important for staple strength as a wool quality specification. Low staple strength is commonly seen as tenderness in wool which leads to discounts in price received and wool quality. The key to avoiding tenderness or a break in staple strength is providing good nutrition throughout the cycle of the animal's wool growth. Nutrition management can include the growing of a forage crop to provide feed during peak demand periods like late pregnancy and weaning.

Filling feed gaps by providing supplementary feeding or forage crops is financially worthwhile as the costs involved is less than the premium paid for non-tender wool. However, during prolonged feed gaps such as a drought, this strategy is not used because the purpose of supplementary feeding is about survival rather than production.

## Question 24

Criteria	Marks
<ul style="list-style-type: none"> <li>• Demonstrates a comprehensive understanding of the effectiveness of an advertising or promotional campaign for the product</li> <li>• Makes an informed judgement based on value, outcomes or results</li> </ul>	6
<ul style="list-style-type: none"> <li>• Demonstrates a sound understanding of the effectiveness of an advertising or promotional campaign for the product</li> <li>• Makes some judgement based on value, outcomes or results</li> </ul>	5
<ul style="list-style-type: none"> <li>• Demonstrates some understanding of the effectiveness of an advertising or promotional campaign for the product</li> <li>• Makes some judgement based on value</li> </ul>	4
<ul style="list-style-type: none"> <li>• Describes the effectiveness of an advertising or promotional campaign for the product</li> </ul>	2–3
<ul style="list-style-type: none"> <li>• Provides some relevant information</li> </ul>	1

### **Sample answer:**

An advertising program to promote the consumption of lamb is run each year. One of these was 'Too Easy'. Lamb is promoted as a product which brings people together, but also highlighting how easy it is to cook.

These advertisements have a humorous tone and emphasise that lamb is produced in Australia, which implies a measure of safety and quality. The advertising campaign is usually spear-headed by TV advertising, and these usually occur around Australia Day. These ads are supplemented by in-store promotions and recipe cards.

This promotional campaign has been shown to increase consumption of lamb by over 30%. MLA has estimated that there is four times returns on the advertising costs in increased sales.

Overall these campaigns have been very successful in increasing sales and market share while continuing to increase awareness of lamb meat to consumers.

### Question 25 (a)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides the purpose of randomisation and standardisation in the design of an experiment</li> </ul>	4
<ul style="list-style-type: none"> <li>Provides the purpose of randomisation or standardisation in the design of an experiment and makes some reference to the other element</li> </ul>	3
<ul style="list-style-type: none"> <li>Provides the purpose of randomisation or standardisation in the design of an experiment</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

Standardisation is needed to control all the variables other than what is being tested (density). This ensures the differences observed are from the variable that is being tested, making the experiment valid.

Randomisation ensures that all treatments have an equal chance of being allocated to a position in the treatment area. This prevents bias from occurring due to any variability across the test area and allows a valid comparison to be made.

### Question 25 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Describes how the student could include randomisation and standardisation in the experimental design</li> </ul>	4
<ul style="list-style-type: none"> <li>Describes how the student could include randomisation or standardisation in the experimental design and outlines how the other element could be included</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines how the student could include randomisation and standardisation in the experimental design</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>Describes how the student could include randomisation or standardisation in the experimental design</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

Standardisation – the only variable changed in the trial was the density/number of seeds sown. Everything else was the same eg seeds from the same packet, pot the same size, potting mix was from the same bag, same amount and type of fertiliser, all received the same amount of water.

Randomisation – pots were numbered 1–9 and then those numbers were placed in a hat. The three densities; high, standard and low were also placed in a hat. We randomly selected a number and treatment type to allocate a treatment to a pot.

### Question 25 (c)

Criteria	Marks
• Provides a sound explanation of why farmers control weeds to manage sources of plant competition	4
• Provides some explanation of why farmers control weeds to manage source of plant competition	3
• Describes sources of plant competition and/or control of weeds	2
• Provides some relevant information	1

**Sample answer:**

Weeds take up moisture from the soil, reducing the amount available for the crop or pasture. Reducing weeds makes more moisture available to the crop/pasture and therefore increase yield.

Weeds can also shade crop or pasture plants reducing the amount of light available to the plant and reducing the plant's ability to photosynthesise and hence reducing crop yields.

**Answers could include:**

- Competition for nutrients
- Competition for space
- Allelopathic effects.

### Question 26 (a)

Criteria	Marks
• Provides sound justification for the choice of breed and slaughter point to meet consumer requirements	4
• Provides some justification for the choice of breed AND/OR slaughter point to meet consumer requirements	3
• Identifies the correct breed and slaughter point with limited justification	2
• Provides some relevant information	1

**Sample answer:**

To meet the stated market requirements a farmer would be best to choose Breed A as it has a relatively higher muscle to fat ratio, lean and well-muscled.

By choosing slaughter point 1 there is the greatest difference between muscle and fat proportion in Breed A, resulting in a lean and muscular carcass.

**Question 26 (b)**

Criteria	Marks
• Provides a sound discussion of the use of HGP's in manipulating an animal's growth and development	4
• Provides some discussion of the use of HGP's in manipulating an animal's growth and development	3
• Provides an outline of the use of HGP's in manipulating an animal's growth and development	2
• Provides some relevant information	1

**Sample answer:**

Hormone growth promotants are considered to be efficient in producing beef of consistent taste, tenderness and colour to meet consumer demand. Implanted cattle show improved daily weight gain, feed conversion ratios and carcass quality through a 10–30% increase in muscle growth.

Some markets ban HGP beef. The EU will not accept beef grown using HGP's and Coles supermarkets now only sell HGP-free beef so using HGP's could limit the farmers' market. There are strict guidelines for sale, use and registration of HGP's. Animal welfare issues are also raised with changes in animal behaviour and infection at implantation sites.

## Question 27

Criteria	Marks
<ul style="list-style-type: none"> <li>Explains TWO management techniques that manipulate reproduction in farm animals and are directly dependent on the interaction of hormones in the oestrus cycle</li> </ul>	8
<ul style="list-style-type: none"> <li>Provides some explanation of the relationship between the interaction of hormones in an animal's oestrus cycle and management techniques used to manipulate reproduction in farm animals, dependent on this interaction</li> </ul>	6–7
<ul style="list-style-type: none"> <li>Explains one management technique used to manipulate reproduction in farm animals, linking it directly to the dependence on the hormone interaction in the oestrus cycle</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>Describes management techniques used to manipulate reproduction in farm animals</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>Describes the interaction of hormones in an animal's oestrus cycle</li> </ul>	4–5
<ul style="list-style-type: none"> <li>Describes a management technique used to manipulate animal reproduction or outlines the interaction of hormones in the oestrus cycle</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

### **Sample answer:**

Oestrus synchronisation is a technique used to induce a high proportion of females to show oestrus within a restricted time period chosen by the farmer. Under natural conditions, the oestrus cycle is 'kick started' by a decline in progesterone following the regression of the corpus luteum. If females are given a dose of progesterone any time in their cycle, as the progesterone wears off, their cycle will restart. In oestrus synchronisation subcutaneous implants or intravaginal applications of progesterone or injections of prostaglandin will manipulate the timing of progesterone decline so females treated at the same time will cycle at the same time.

Multiple ovulation or super ovulation is a technique used to cause several eggs to be released at ovulation rather than the natural number eg a single egg usual in cattle. It is used in conjunction with embryo transfer to create multiple embryos. Naturally in the oestrus cycle, the production of follicles and an egg within the ovary in readiness for ovulation is triggered by follicle stimulation hormone. In multiple ovulation an injection of FSH is given which induces more eggs than normal to be ready at ovulation.

## Section II

### Question 28 (a) (i)

Criteria	Marks
• Outlines reasons for the labelling of foods containing GMOs	3
• Outlines a reason for the labelling of foods containing GMOs	2
• Provides some relevant information	1

**Sample answer:**

There is a possibility that GMO foods could cause food intolerance or allergies. Also, some people don't want to eat these types of food.

### Question 28 (a) (ii)

Criteria	Marks
• Describes regulations that are associated with the development and use of GMOs in Australian agriculture	5
• Describes a regulation that is associated with the development or use of GMOs in Australian agriculture and outlines a second regulation	4
• Describes a regulation that is associated with the development or use of GMOs in Australian agriculture OR outlines TWO regulations	3
• Outlines regulation(s) associated with the development and/or use of GMOs in Australian agriculture	2
• Provides some relevant information	1

**Sample answer:**

All GMOs in use in Australian agriculture need to be registered and approved by the government office of gene regulation, this ensures that all safety and biosecurity issues have been addressed before release into the environment.

Companies which sell GMO seed have contractual regulations for their use. They require producers who buy their seeds to include refuge crops and agronomic methods to protect the integrity of the genes against the development of resistance. They also have strict conditions to sell the crop back through the company.

### Question 28 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a comprehensive discussion of TWO uses of biotechnology in agriculture</li> <li>Supports the discussion with relevant examples</li> <li>Presents a logical and cohesive response</li> </ul>	10–12
<ul style="list-style-type: none"> <li>Provides a discussion of the use(s) of biotechnology in agriculture</li> <li>Provides some relevant examples</li> <li>Presents a mainly logical and cohesive response</li> </ul>	7–9
<ul style="list-style-type: none"> <li>Describes TWO uses of biotechnology in agriculture OR a limited discussion of ONE</li> <li>Includes some examples</li> <li>Presents an organised response</li> </ul>	4–6
<ul style="list-style-type: none"> <li>Outlines some uses of biotechnology in agriculture</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Answers could include:**

Points for and/or against:

- Genetically modified organisms
- Vaccine development
- Herbicide tolerance
- Use of rumen modifiers
- Plant growth regulators
- Biopesticides
- Gene markers
- Embryo splitting.

### Question 29 (a) (i)

Criteria	Marks
<ul style="list-style-type: none"> <li>Outlines the sources of the THREE greenhouse gases from agricultural systems</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines sources of TWO of the greenhouse gases from agricultural systems</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

Carbon dioxide comes from the emissions by fossil-fuelled machinery used in agriculture.

Methane comes from ruminant animals.

Nitrous oxides are emitted from the use of nitrogen fertilisers.

**Question 29 (a) (ii)**

Criteria	Marks
• Describes methods which can be used to reduce the concentration of greenhouse gas in agricultural systems	5
• Describes a method which can be used to reduce the concentration of a greenhouse gas and outlines a second method in agricultural systems	4
• Describes a method which can be used to reduce the concentration of a greenhouse gas in agricultural systems OR outlines TWO methods	3
• Outlines a method to reduce the concentration of greenhouse gas(es) in the atmosphere	2
• Provides some relevant information	1

**Sample answer:**

The concentration of Greenhouse gas in the environment can be reduced by either reducing the emissions, or by capturing and storing it.

CO<sub>2</sub> emissions can be captured in soils in the form of increased organic matter. This is achieved by changing management practices eg increasing the pasture ley phase.

Methane emission from agriculture can be reduced by modifying the diets of ruminants. This can be achieved by the use of seaweed supplements that result in a change rumen micro-flora, thereby producing less methane.

### Question 29 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a comprehensive discussion of TWO management options a farmer could use</li> <li>Supports the discussion with relevant examples</li> <li>Presents a logical and cohesive response</li> </ul>	10–12
<ul style="list-style-type: none"> <li>Provides a discussion of the management option(s) a farmer could use</li> <li>Provides some relevant examples</li> <li>Presents a mainly logical and cohesive response</li> </ul>	7–9
<ul style="list-style-type: none"> <li>Describes TWO management options a farmer could use OR provides a limited discussion for ONE</li> <li>Includes some examples</li> <li>Presents an organised response</li> </ul>	4–6
<ul style="list-style-type: none"> <li>Outlines some management option(s) a farmer could use</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Answers could include:**

Points for and/or against:

- Varieties or breeds
- Planting or birthing times
- Soil moisture conservation
- Stocking rates
- Plant density
- Fodder conservation
- Enterprise change.

### Question 30 (a) (i)

Criteria	Marks
<ul style="list-style-type: none"> <li>Outlines issues relating to the funding of research and development of agricultural technologies</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines an issue related to the funding of research and development of agricultural technologies</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

If funding is from private equity, a financial return is expected. This may result in essential but unprofitable research not occurring.

Private equity funding can produce a conflict of interest where a favourable research result is expected.

### Question 30 (a) (ii)

Criteria	Marks
<ul style="list-style-type: none"> <li>Describes methods that can be used to market a new technological development to farmers</li> </ul>	5
<ul style="list-style-type: none"> <li>Describes a method that can be used to market a new technological development to farmers and outlines another marketing method</li> </ul>	4
<ul style="list-style-type: none"> <li>Describes a method that can be used to market a new technological development to farmers OR outlines TWO methods</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines a method that can be used to market a new technological development to farmers</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

Marketing can be conducted by organising field days to demonstrate the use of the new technology and to indicate the economic value of the investment.

Another method is endorsements from people who have adopted the technology which can be published in articles or advertisements in industry-based publications.

### Question 30 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides a comprehensive discussion of TWO uses of new agricultural technology</li> <li>Supports the discussion with relevant examples</li> <li>Presents a logical and cohesive response</li> </ul>	10–12
<ul style="list-style-type: none"> <li>Provides a discussion of the use(s) of new agricultural technology</li> <li>Provides some relevant examples</li> <li>Presents a mainly logical and cohesive response</li> </ul>	7–9
<ul style="list-style-type: none"> <li>Describes TWO uses of new agricultural technology OR a limited discussion of ONE</li> <li>Includes some examples</li> <li>Presents an organised response</li> </ul>	4–6
<ul style="list-style-type: none"> <li>Outlines some new agricultural technology(ies) and/or of new technology</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Answers could include:**

Points for and/or against:

- Satellite technology
- Computer technology
- Biotechnology
- Electronic identification systems
- Robotics.

# 2023 HSC Agriculture Mapping Grid

## Section I Part A

Question	Marks	Content	Syllabus outcomes
1	1	Historical development of Australian land use practices	H1.1
2	1	Physical characteristics of soil	H1.1
3	1	Marketing strategies	H3.1, H3.4
4	1	Product quality and quantity	H3.1, H3.2
5	1	Pasture production systems	H2.1
6	1	Soil degradation	H1.1
7	1	Responsible and strategic use of chemicals	H2.1
8	1	Managing plant production systems	H2.1
9	1	Ruminant and rumen microbes	H2.2
10	1	Animal ethics and welfare	H2.2, H5.1
11	1	Supply and demand for a product	H3.1
12	1	Financial pressures	H3.1, H3.4
13	1	Techniques to manage soil fertility	H1.1
14	1	Use of plant breeding to develop new plant varieties	H2.1
15	1	Objective measurement and heritability	H2.2
16	1	Integrated pest management (IPM)	H2.1, H2.2
17	1	Photosynthesis and respiration	H2.1
18	1	Collection and analysis of data	H4.1
19	1	Collection and analysis of data	H4.1
20	1	Managing nutritional requirements	H2.2

## Section I Part B

Question	Marks	Content	Syllabus outcomes
21 (a) (i)	1	Nutrient cycles	H1.1
21 (a) (ii)	2	Nutrient cycles	H1.1
21 (b)	3	Role of microbes and invertebrates	H1.1
22 (a)	3	Government influence on production and marketing	H3.2
22 (b)	5	Marketing options	H3.2
23 (a)	2	Market specifications	H3.2
23 (b)	4	Timing of operations to meet market specifications	H3.3
23 (c)	6	Management strategies to meet market specifications	H3.4
24	6	Advertising and promotion in the marketing of a product	H3.3
25 (a)	4	Experimental design	H4.1
25 (b)	4	Experimental design	H4.1
25 (c)	4	Competition in plant communities	H2.1
26 (a)	4	Relate animal growth and development to consumer needs	H2.2

<b>Question</b>	<b>Marks</b>	<b>Content</b>	<b>Syllabus outcomes</b>
26 (b)	4	Management practices to optimise growth and development	H2.2
27	8	Reproductive techniques	H2.2

**Section II**

<b>Question</b>	<b>Marks</b>	<b>Content</b>	<b>Syllabus outcomes</b>
28 (a) (i)	3	Importance of food safety and labelling of genetically modified organisms (GMOs)	H5.1
28 (a) (ii)	5	Regulations for development and use of GMOs	H5.1
28 (b)	12	Current areas of development in biotechnology	H3.4, H5.1
29 (a) (i)	3	Sources of greenhouse gas emissions	H5.1
29 (a) (ii)	5	Methods to reduce greenhouse gases	H3.4, H5.1
29 (b)	12	Management options to manage climate variability	H3.4
30 (a) (i)	3	Issues relating to research and development	H5.1
30 (a) (ii)	5	Marketing of technology developments	H5.1
30 (b)	12	Developments in agricultural technologies	H5.1