2020 HSC Agriculture Marking Guidelines

Section I, Part A

Multiple-choice Answer Key

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

Section I, Part B

Question 21 (a)

Criteria	Marks
• Outlines the soil degradation problem	2
• Provides some relevant information	1

Sample answer:

Dryland salinity is an accumulation of dissolved salts moved to the plant root zone, carried by rising water tables.

Answers could include:

- Erosion
- Structural decline
- Acidification
- Loss of soil organic matter.

Question 21 (b)

Criteria	Marks
• Provides a clear link between the land use practice and the soil degradation problem	3
• Outlines a practice that causes the soil degradation problem	2
• Provides some relevant information	1

Sample answer:

The land management practice of clearing trees for pasture or cropping has led to dryland salinity. Deep-rooted trees will take up groundwater, keeping the water table at a lower level. Clearing these trees results in the rise of the water table, which brings dissolved salts closer to the surface. This causes an accumulation of salts in the plant root zone.

Question 21 (c)

Criteria	Marks
• Makes clear links between the sustainable management practice and the alleviation of the soil degradation problem	4
• Describes a sustainable management practice and how it can alleviate the problem	3
• Outlines a sustainable management technique and/or how it is used to alleviate the soil degradation problem	2
• Provides some relevant information	1

Sample answer:

A sustainable management practice is to plant salt resistant perennial crops or pastures. Suitable species could include saltbush (medium rooted perennial) or tall wheat grass (shallow rooted perennial grass).

As these plant root systems develop in the soil, they increasingly access soil water which they remove through transpiration. This lowers the water table over time leaving salt in a non-soluble form, not available to plants.

Question 22 (a)

Criteria	Marks
• Provides characteristics and features of a marketing chain for an agricultural product	3
• Outlines some aspect(s) of a marketing chain for an agricultural product	2
• Provides some relevant information	1

Sample answer:

Milk goes through a number of steps as it moves from the producer to the consumer. Firstly, the raw milk is sold by the dairy farmer to a milk factory (a processor).

The factory processes the milk by pasteurisation and homogenisation then packages it into cartons and bottles.

The factory will then sell this milk to retailers such as supermarkets.

At the supermarket, consumers buy the milk and so complete the marketing chain.

Question 22 (b)

Criteria	Marks
• Describes two government influences on the production of agricultural products in Australia, including specific examples	4
• Outlines two government influences on the production of agricultural products, including an example(s) OR • Describes one government influence on the production of agricultural products in Australia including an example	3
• Outlines one government influence on the production of agricultural products	2
• Provides some relevant information	1

Sample answer:

Government regulations regarding the use of chemicals is one way governments can influence production. Every chemical has restrictions for its use. These restrictions include withholding periods, re-application period etc. This can influence when and how a chemical is used and the timing of marketing a product.

Another influence is through free trade agreements such as the Transpacific partnership. These can influence production in Australia by allowing free exports into Asian countries and so boosting demand for Australian agricultural products. This provides an incentive for Australian farmers to increase production.

Question 23 (a)

Criteria	Marks
• Describes the effect of the pest/disease on the plant	3
• Outlines the effect on the plant	2
• Provides some relevant information	1

Sample answer:

In table grapes, powdery mildew can affect the visual appeal and the taste. It causes reduced berry size, scarring and reduced colour, as well as reduced sugar content.

Question 23 (b)

Criteria	Marks
• Demonstrates comprehensive understanding of the links between the management of both the environment and the plant and the control of the pest or disease	5
• Demonstrates sound understanding of links between the management of both the environment and the plant and the control of the pest or disease	4
• Demonstrates some understanding of links between management of the environment and/or the plant and the control of the pest or disease	3
• Outlines a relevant management technique	2
• Provides some relevant information	1

Sample answer:

Environmental control:
To manage outbreaks of powdery mildew in grapevines, the producer can manage the canopy by pruning, leaf picking or using deficit irrigation to create an open canopy. An open canopy allows good airflow to reduce humidity and shading. Fungal infections such as powdery mildew grow best in humid, shaded areas created by a dense canopy.

Plant manipulations:
Maintaining optimal plant health by managing levels of calcium, phosphorus, potassium and boron will make the plant more resistant to infection. This maintenance results in higher cell strength which in turn reduces the capacity for the fungus to penetrate leaves or berries.

Answers could include:

Resistant rootstock – planting orientation – plant nutrition – resistant varieties – crop rotation – maintaining good ground cover – aspect – GMO.

Question 24 (a)

Criteria	Marks
• Describes a way of value adding to the named product within the marketing chain	3
• Outlines a way of value adding to the named product	2
• Provides some relevant information	1

Sample answer:

Product: *Lamb*

Retailers package cuts of lamb that are flavoured/crumbed etc, such as souvlaki strips. These ‘ready to cook’ pre-packaged servings appeal to consumers due to convenience (prep and cooking) so consumers are prepared to pay more.

Question 24 (b)

Criteria	Marks
• Demonstrates comprehensive understanding of the links between the assessment of the quality of a product and farm management decisions, using specific and relevant examples	4
• Demonstrates sound understanding of link(s) between an aspect of quality and farm management decisions, using examples	3
• Outlines the decisions made on farms related to aspects of product quality and/or quality criteria of a product, using an example	2
• Provides some relevant information	1

Sample answer:

In meat production there are many ways to assess quality, such as key specifications in set markets for lamb. For example, specifications for 'Supermarkets' are: no permanent teeth; 18–22 kg carcass weight and fat scores 2 and 3; second cross preferred.

Producers can manipulate breeding, feeding and welfare of animals to meet specific market criteria. For example, selecting early maturing breeds will get a fatter carcase at an earlier age. Use of EBVs within a selected breed can result in desired carcass characteristics. Feeding during development and prior to sale can alter fat score, eg the use of grain and pelleted supplements closer to sale.

Question 24 (c)

Criteria	Marks
• Demonstrates a comprehensive understanding of an advertising or promotional campaign for the product • Makes an informed judgement of its value, outcomes or results	6
• Demonstrates a sound understanding of an advertising or promotional campaign for the product • Makes some judgement of its value, outcomes or results	5
• Demonstrates some understanding of an advertising or promotional campaign for the product • Makes some judgement of its value	4
• Describes an advertising or promotional campaign for the product	2–3
• Provides some relevant information	1

Sample answer:

Lamb – MLA 'Too Easy' annual summer campaign. MLA has run a highly successful 6-week advertising campaign each year to maintain brand awareness and increase sales to match lamb production cycles. In some years, consumption has increased over 30%. There is a stated 4-fold return on the advertising spent due to the very effective strategies used. The current 'Too Easy' campaign targets all market areas and aims to have lamb seen as an inclusive product bringing all people together while concentrating on the ease of cooking lamb. While these ads have unexpected elements to grab attention and emotive themes as well as an overall humorous tone, the lamb is central to the story. As consumers are concerned more about where their food comes from, the 'Aussie home-grown' element is highlighted, as is the exceptional quality aspect. The campaign involves intensive TV advertising, usually around Australia Day, plus digital, social and in-store ads and promotion which includes recipe cards and an association with a well-known celebrity chef. Overall these MLA lamb campaigns have been very successful in increasing market share and maintaining the 'lamb' brand while evolving year to year to be in line with consumer expectations.

Question 25 (a)

Criteria	Marks
• Outlines a process occurring in the rumen	2
• Provides some relevant information	1

Sample answer:

The rumen is the site of microbial digestion. The microbial population allows cellulose to break down into VFAs.

Question 25 (b)

Criteria	Marks
• Demonstrates comprehensive understanding of the links between the stages of the production cycle and the different feed rations required for a specific animal • Provides specific examples	6
• Demonstrates sound understanding of links between the stages of the production cycle and the different feed rations required for a specific animal • Provides examples	5
• Demonstrates some understanding of links between the stages of the production cycle and the different feed rations required for a specific animal • Provides example(s)	4
• Outlines different rations and/or requirements at different stages of production	2–3
• Provides some relevant information	1

Sample answer:

Laying Hens
From 0–6 weeks, newly hatched laying hens need a starter feed ration of about 22% protein and high energy to ensure high growth rate to rapidly grow to partly feathered. This high energy/protein mix is expensive but they eat very little. It is fed in a crumble form so that it is small enough for the chick to be able to access. Beak size and gullet development at this stage won't allow for pelleted feed.

From 7–20 weeks (feathering to laying) the feed is still in the form of a crumble but has a lower protein content, usually 18%, and is referred to as grower feed. It still supports rapid growth and development, but is of a lower cost due to the lower protein content.

Over 20 weeks, the layer ration is more economical but is pelleted due to the maturation of their gullet and larger beak size. Protein content is around 16%, much lower compared to the starter feed. The lower protein is just sufficient to support egg production and maintenance as growth is finished. Fibre is included in all rations to promote and maintain gut health.

Answers could include:

- Flushing
- Stage of lactation
- Finishing carcass animals
- Milk composition/seasonal changes.

Question 26 (a)

Criteria	Marks
• Outlines the change in the contribution to Australia's GDP of the Agriculture sector relative to the other sectors	2
• Provides some relevant information	1

Sample answer:

In the early 1900s, the Agriculture sector's contribution was at its highest at about 30%, and well above Manufacturing and Mining. From 1950 it steadily declined from 20% to negligible levels, falling and keeping below Manufacturing and since 1980, even below the Mining sector. The contribution by Other (services etc) has always been significantly larger and has steadily increased since the 1950s to 80% in 2016.

Question 26 (b)

Criteria	Marks
• Shows the difference between the business structure of the family farm and that of the corporate enterprise	3
• Outlines aspects of family farms and/or corporate enterprises	2
• Provides some relevant information	1

Sample answer:

Corporate enterprises are large scale, owned by large companies which have access to capital for large scale investment in technology, equipment and resources.

By contrast, family farms are owner-operated often on relatively small landholdings. The self-employed farmer works long hours and is not covered by industry awards.

Question 27 (a)

Criteria	Marks
• Completes the table correctly	4
• Partially completes the table	2–3
• Provides a correct hormone or correct effect	1

Sample answer:

	Hormone name	*One effect of the hormone*
Plant hormone	Auxin	Causes stem elongation
	Abscisic acid	Triggers stomatal closure
Animal hormone	Luteinising hormone	Stimulates release of an ova from ovary (ovulation)
	Oestrogen	Regulates the oestrus cycle

Question 27 (b)

Criteria	Marks
• Identifies issues and provides comprehensive points for/against the use of hormones in embryo transfer and also considers economic factors	6
• Identifies issues and provides points for/against the use of hormones in embryo transfer and also considers economic factors	5
• Describes some issues related to hormonal treatment in embryo transfer and/or some economic factors of embryo transfer	3–4
• Outlines hormonal treatments used in embryo transfer and/or some economic factors of embryo transfer	2
• Provides some relevant information	1

Sample answer:

Embryo transfer is the process of taking an embryo from a donor female, and implanting it into a recipient animal (called a surrogate). This process is usually done in conjunction with multiple ovulation, where the donor animal produces many embryos, which are implanted into a number of surrogates.

The hormonal treatments needed to achieve this are firstly oestrous synchronisation. This means all the animals involved are at the same point in their menstrual cycles. Oestrus synchronisation is achieved by using the hormones progesterone and prostaglandin. There are a number of different methods for this, one is using a vaginal sponge (called a CIDR) with prostaglandin followed by an injection(s) of progesterone.

Embryo transfer with multiple ovulation can allow one female to contribute more offspring to the next generation than other females. For a superior animal, this can be used to improve the genetic merit of the next generation. However, this strong hormonal treatment can be detrimental to the health and long-term fertility of the donor animal. For multiple ovulation of the donor, an additional step of injections of follicle stimulating hormone is included.

Embryo transfer is a very expensive process and so is only undertaken when there is a direct economic benefit (make a profit). Donor females need to be of high genetic merit. The progeny of this female are likely to be of high merit, and can be sold for a high price. Due to multiple ovulation many valuable offspring can be produced and sold.

Section II

Question 28 (a) (i)

Criteria	Marks
• Defines *genetic engineering*, including an example	2
• Provides some relevant information	1

Sample answer:

Genetic engineering – altering gene sequences (DNA) of an organism using modern biotechnological techniques so that the organism will have specific characteristics.
For example Bt genes from a bacteria can be engineered into crop plants to make them resistant to caterpillars.

Question 28 (a) (ii)

Criteria	Marks
• Provides a clear explanation of the use of gene markers in agricultural production	6
• Provides some explanation of the use of gene markers in agricultural production	5
• Describes aspects of the use of gene markers in agricultural production	3–4
• Outlines aspects of the use of gene markers in agricultural production	2
• Provides some relevant information about gene markers	1

Sample answer:

Gene markers can be used to track inheritance of specific genes in an organism/offspring.

An example is the ‘snip chip’ in the sheep industry. SNP chip is a pedigree test, which uses a blood/tissue sample from the animal to determine if multiple genes are present, linked to production traits such as polled/horned status, increased growth or carcass quality. SNP chip gene marker testing can improve agricultural production by allowing fast tracking of genetic progress through identification of superior animals, reduction of production cost as undesired progeny can be culled and by production that is more efficient eg increased growth rates.

Question 28 (b)

Criteria	Marks
• Demonstrates a comprehensive understanding of the conflict between increasing production and ethical concerns in relation to ONE biotechnology innovation • Presents a logical and cohesive response • Communicates ideas and information using relevant examples	10–12
• Describes implications of increasing production and ethical concerns in relation to ONE biotechnology innovation • Presents a mostly logical and cohesive response • Includes a relevant example	7–9
• Describes implication(s) of increasing production AND/OR ethical concern(s) in relation to ONE biotechnology innovation • Presents an organised response	4–6
• Outlines increasing production OR ethical issues in relation to ONE biotechnology innovation	2–3
• Provides some relevant information	1

Answers could include:

Grain production for human consumption vs bio fuel.

GM products with increased quality/quantity characteristics to reduce resource use eg Aquadvantage salmon vs food safety and risk.

GM cotton decreased environmental impact vs development of super weeds – resistant cultivars.

Question 29 (a) (i)

Criteria	Marks
• Gives what the SOI is	2
• Provides some relevant information	1

Sample answer:

The SOI measures the difference in the mean sea level pressure between Tahiti and Darwin.

Question 29 (a) (ii)

Criteria	Marks
• Describes the trend of El Nino events • Describes the implications for Australian agriculture	6
• Outlines the trend of El Nino events • Describes some implications for Australian agriculture	5
• Outlines the trend of El Nino events • Outlines some implications for Australian agriculture	4
• Identifies the trend of El Nino events OR • Outlines implication(s) for Australian agriculture of either El Nino or La Nina	2–3
• Provides some relevant information	1

Sample answer:

The overall trend has been of positive SOIs to negative SOIs. In 2009 they were mostly negative while in 2010–2011 the SOIs were mostly positive. In 2012–2013 they changed from negative to positive but have been in the negative range since 2014, with a significant number of months in each year being below -7 sustaining an El Nino event.

El Nino events are correlated with lower rainfall compared to average years. Increasing numbers of El Nino events lead to more frequent drought years and more severe drought years.

The increasing frequency, duration and severity of drought years means that Australian farmers need to adapt by changing management practices, for example growing drought tolerant pastures.

Changes in drought frequency could require producers to change their enterprises to those requiring less water, for example moving from dairy to beef.

Question 29 (b)

Criteria	Marks
• Demonstrates a comprehensive understanding of water storage and water trading and the implications for agriculture in Australia • Presents a logical and cohesive response • Communicates ideas and information using relevant examples	10–12
• Demonstrates a sound understanding of water storage and water trading and some of the implications for agriculture in Australia • Presents a mostly logical and cohesive response • Includes a relevant example	7–9
• Describes water storage and water trading or issues related to water storage and water trading with some links to agriculture • Presents an organised response	4–6
• Outlines water storage and/or trading	2–3
• Provides some relevant information	1

Answers could include:

- Issues of shifting allocation eg zero allocation
- Environmental flows – timing, carry over
- Impacts of lining / piping – reduces leakage to aquifer
- Fragmentation of irrigation areas
- Impact of ownership of water not land
- Use of bores / over allocation.

Question 30 (a) (i)

Criteria	Marks
• Outlines a funding source available for research and development of new agricultural technologies	2
• Provides some relevant information	1

Sample answer:

A source of funding for research and development in agriculture is government research and development tax offsets.

Eligible projects can attract more than 40% of the cost of research and development as a tax offset.

Question 30 (a) (ii)

Criteria	Marks
• Provides detailed points for and/or against patents in relation to research and development of agricultural technologies	6
• Provides some points for and/or against patents in relation to research and development of agricultural technologies	5
• Describes aspects of patents in relation to research and development of agricultural technologies	3–4
• Outlines some aspects of patents in relation to agricultural technologies	2
• Provides some relevant information	1

Sample answer:

Patents are a legal protection over the intellectual property invested in the research and development of a new technology.

Patents provide some financial surety to the developer. This can be a good thing as it allows the developer to turn a profit over time from it by either producing the innovation or licensing others to produce it. A disadvantage is the significant cost involved in applying for a patent and also the high patent fees.

Another issue is the effect of patents on the development of other technologies. A successful patent which is not licensed widely can remove competition from the market. However, a tightly controlled patent can be a strong incentive for the development of alternative and even more efficient technologies.

Question 30 (b)

Criteria	Marks
• Demonstrates a comprehensive understanding of the impact of a technological development on the agricultural industry in terms of both economic and social factors, including a well-informed judgement • Presents a logical and cohesive response • Communicates ideas and information using relevant examples	10–12
• Demonstrates a sound understanding of the impact of a technological development on the agricultural industry in terms of both economic and social factors, including an informed judgement • Presents a mostly logical and cohesive response • Includes a relevant example	7–9
• Identifies issues and provides points for and/or against the technological development in terms of economic and/or social factors • Presents an organised response	4–6
• Outlines a technological development with some reference to social and/or economic factors	2–3
• Provides some relevant information	1

Answers could include:

- Cost of the technology
- Reduced labour costs
- More family time
- Reduced employment opportunity.

2020 HSC Agriculture
Mapping Grid

Section I
Part A

Question	Marks	Content	Syllabus outcomes
1	1	Illustrate carbon cycle	H1.1
2	1	Chemical and physical characteristics of soil	H2.1
3	1	Chemical characteristics of a soil	H2.1
4	1	Animal ethics and welfare	H2.2
5	1	Reproductive techniques	H2.2
6	1	Marketing strategies	H3.2
7	1	Plant production system net assimilation rate	H2.1
8	1	Competition in plant communities	H2.1
9	1	Factors that limit the fertility of animals	H2.1
10	1	Pasture production systems	H2.1
11	1	Role of microbes and invertebrates in soil	H1.1, H2.1
12	1	Integrated pest management	H2.1, H2.2
13	1	Breeding systems	H2.2
14	1	Ruminant and monogastric digestion	H2.2
15	1	Animal nutrition	H2.2
16	1	Experimental design	H4.1
17	1	Experimental design	H4.1
18	1	Decision making processes and management strategies	H3.1
19	1	Analysis of data	H4.1
20	1	Supply and demand for a product	H3.1

Section I
Part B

Question	Marks	Content	Syllabus outcomes
21 (a)	2	Soil degradation	H1.1, H2.1
21 (b)	3	Soil degradation	H1.1, H2.1
21 (c)	4	Soil degradation	H1.1, H2.1
22 (a)	3	Marketing chain for a product	H3.1
22 (b)	4	Government influence on production	H3.1
23 (a)	3	Host, organism, environment interaction	H2.1
23 (b)	5	Host, organism, environment interaction	H2.1
24 (a)	3	Value adding a product	H3.3
24 (b)	4	Management strategies to meet market specifications	H3.4
24 (c)	6	Advertising and promotion of a product	H3.3
25 (a)	2	Ruminant and monogastric digestion	H2.2

Question	Marks	Content	Syllabus outcomes
25 (b)	6	Managing nutritional requirements	H2.2
26 (a)	2	Importance of farms in the economy	H3.1
26 (b)	3	Place of the farm in agricultural business community	H3.1
27 (a)	4	Plant hormones, animal hormones	H2.1, H2.2
27 (b)	6	Animal reproduction	H2.2

Section II

Question	Marks	Content	Syllabus outcomes
28 (a) (i)	2	Define genetic engineering	H5.1
28 (a) (ii)	6	Gene markers	H5.1
28 (b)	12	Ethics of biotechnology	H5.1
29 (a) (i)	2	Cause of climate change variability	H3.4
29 (a) (ii)	6	Cause of climate change variability	H3.4
29 (b)	12	Managing resources	H4.1
30 (a) (i)	2	Issues relating to research and development	H4.1
30 (a) (ii)	6	Issues relating to research and development	H4.1
30 (b)	12	Development in agricultural technologies	H3.1