

2022 HSC Agriculture Marking Guidelines

Section I, Part A

Multiple-choice Answer Key

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

Section I, Part B

Question 21 (a)

Criteria	Marks
• Describes the role of ONE invertebrate in decomposition within the soil	3
• Outlines the role of invertebrates in decomposition	2
• Provides some relevant information	1

Sample answer:

Earthworms physically fragment organic matter into smaller pieces increasing the surface area, which enhances microbial chemical action, and they incorporate residues in the soil. Earthworms also improve soil aeration to the benefit of aerobic decomposer microbes.

Question 21 (b)

Criteria	Marks
• Correctly identifies the process at X and clearly links the contribution of this process to the cycling of the nutrient	4
• Correctly identifies the process at X and makes some link between the process and nutrient cycling	3
• Correctly identifies and outlines the process at X OR	2
• Outlines the cycling of the nutrient	
• Provides some relevant information	1

Sample answer:

Nitrogen fixation occurs at X. Rhizobia bacteria cause nodules to form on the roots of legume plants and convert atmospheric nitrogen into a form the legume plant can use. When residues from the legume plant are decomposed, usable nitrogen compounds are released for uptake by other plants. Plants grown in close proximity to the legumes may also have access to usable nitrogen.

Question 22 (a)

Criteria	Marks
• Describes a program that involves government and community groups working together to protect environmental resources	3
• Outlines a program to protect environmental resources	2
• Provides some relevant information	1

Sample answer:

Landcare is a program where community groups identify a significant environmental problem in their area, such as acidification, salinity or soil erosion, and set out to rectify it. This community initiative is supported by government funding which allows for the purchase of materials and equipment required to plan rectification of the identified problem.

Answers could include:

- Total catchment management
- Coast care
- Wild dog program.

Question 22 (b)

Criteria	Marks
• Provides a comprehensive description of the interactions between the elements in relation to a plant or animal disease	4
• Describes some linkages between the elements in relation to a plant or animal disease	3
• Outlines some aspect(s) of the pest or disease	2
• Provides some relevant information	1

Sample answer:

The disease triangle illustrates the importance of all three elements being present for disease to exist. In the case of Sheep Blow Fly, the pest has to be present and the host has to be susceptible. The environment can favour the pest and/or be detrimental to the host animal, the sheep, increasing its susceptibility to attack. High temperatures and moist conditions favour fly reproduction and increase pest numbers. Sheep that have an abundance of wool that is affected by urine and faecal matter will be more likely to be attacked.

Question 23 (a)

Criteria	Marks
<ul style="list-style-type: none"> • Outlines how the physical and behavioural characteristics can influence an animal's management 	3
<ul style="list-style-type: none"> • Outlines the influence of a physical or a behavioural characteristic on an animal's management 	2
<ul style="list-style-type: none"> • Provides some relevant information 	1

Sample answer:

To reduce handling or movement problems with cattle, cows should not be approached from their blind spot, directly behind them, as they can easily be 'spooked'.

Cattle develop an order of social dominance within a herd. To ensure adequate water for all cattle there should be multiple water points so dominant cows cannot monopolise a single source.

Question 23 (b)

Criteria	Marks
<ul style="list-style-type: none"> • Provides detailed points for and/or against the ethical issue that has an impact on an animal production system 	4
<ul style="list-style-type: none"> • Provides a detailed point for or against the ethical issue that has an impact on an animal production system <p>OR</p> <ul style="list-style-type: none"> • Provides some points for and/or against the ethical issue impacting an animal production system 	3
<ul style="list-style-type: none"> • Outlines an ethical issue relevant to an animal production system 	2
<ul style="list-style-type: none"> • Provides some relevant information 	1

Sample answer:

Live export of animals

Australia's live export trade is a billion dollar industry and supplies much of Asia's and the Middle East's necessary and affordable protein, meeting specific needs of the importing country (eg slaughter). Australia, using its local animal welfare laws and regulations, participates in schemes to improve livestock welfare in importing countries.

The export of live animals gives rise to serious welfare problems relating to the conditions during a sea voyage of sometimes five weeks. Conditions and treatment of animals at the destination are also of concern. Temporary bans on trade have been undertaken because of this, affecting the supply and prices received in domestic markets.

Question 24 (a)

Criteria	Marks
<ul style="list-style-type: none"> Provides a comprehensive description of the changes in the proportion of muscle, fat and bone during the growth and development of an animal 	4
<ul style="list-style-type: none"> Describes the proportion of muscle, fat and bone during the growth and development of an animal 	3
<ul style="list-style-type: none"> Outlines features of growth and development of an animal 	2
<ul style="list-style-type: none"> Provides some relevant information 	1

Sample answer:

When an animal is born it has a high proportion of bone to muscle with little fat. Muscle development is initially rapid and is higher in proportion compared to fat and bone development. Bone development is slow but consistent as the muscles develop. As the muscle and bone development slow down, the excess energy consumed is laid down as fat.

Question 24 (b)

Criteria	Marks
<ul style="list-style-type: none"> Describes in detail how environmental factors may affect fertility 	4
<ul style="list-style-type: none"> Describes how an environmental factor affects fertility and outlines another factor 	3
<ul style="list-style-type: none"> Outlines an environmental factor(s) affecting fertility 	2
<ul style="list-style-type: none"> Provides some relevant information 	1

Sample answer:

Male animals subjected to high temperatures may have a decreased sperm count or lower sperm mobility as heat affects both the sperm and their production. As a result fertility is affected.

Pest and disease (attack/infection) of an animal limits the ability for the animal to function normally. If there is a high number of internal (worm) or external parasites (ticks/lice) this will affect the animal's ability to function due to weight loss or lack of energy and the body will compensate for this by not cycling or by lowering sperm counts which reduces fertility of the animal and the ability for it to successfully reproduce.

Question 25 (a)

Criteria	Marks
<ul style="list-style-type: none"> Describes in detail how interest rates and the dynamic nature of markets influence the financial pressures on farmers 	4
<ul style="list-style-type: none"> Describes how either interest rates or the dynamic nature of markets influences the financial pressures on farmers and outlines the other 	3
<ul style="list-style-type: none"> Outlines how interest rates and/or the dynamic nature of markets influence financial pressures on farmers 	2
<ul style="list-style-type: none"> Provides some relevant information 	1

Sample answer:

High interest rates affect farm productivity by reducing the amount of potential money a farmer can afford to borrow and their ability to invest in new and more efficient equipment, stock or infrastructure to help with improving the profitability of the farm.

The dynamic nature of markets can increase the demand for a farm product, eg consumer demand for healthy food choices. Farmers may try to increase the output of their product to take advantage of the higher prices being received, relieving some financial pressure.

Question 25 (b)

Criteria	Marks
<ul style="list-style-type: none"> Provides a comprehensive discussion of marketing strategies available to farmers to market their products 	6
<ul style="list-style-type: none"> Provides a sound discussion of marketing strategies available to farmers to market their products 	5
<ul style="list-style-type: none"> Provides some discussion of marketing strategies available to farmers 	4
<ul style="list-style-type: none"> Provides a comprehensive discussion of a marketing strategy available to farmers to market their products <p>OR</p> <ul style="list-style-type: none"> Demonstrates some understanding of marketing strategies available to farmers 	2–3
<ul style="list-style-type: none"> Provides some relevant information 	1

Sample answer:

Farmers may choose to join together to form a marketing cooperative. This cooperative can then increase their bargaining power and potentially gain access to new markets unavailable to a single farmer. The increase in total volume of product available for sale when farmers combine may allow for a marketing strategy such as local branding, for which a quality assurance guarantee can be used to market their product. The price received for the raw product could be lower overall, but the farmer is not responsible for marketing the product themselves.

Farmers may choose to vertically integrate to improve overall profitability. For example, a wine grower who grows the grapes may then process their own grapes and make wine on the farm to sell at a cellar door on the property. This has the advantage of the farmer being able to control the sale price and the overall returns that are gained by producing the product. It may require a farmer to have expertise and to invest in technologies in areas beyond growing a crop, eg creating and bottling wine and not just growing the grapes.

Question 26

Criteria	Marks
<ul style="list-style-type: none"> Demonstrates a comprehensive understanding of the relationship between plant breeding techniques and developing new varieties which improve aspects of plant production, using specific examples 	6
<ul style="list-style-type: none"> Demonstrates an understanding of the relationship between plant breeding techniques and developing varieties which improve plant production, using examples 	5
<ul style="list-style-type: none"> Demonstrates the relationship between a plant breeding technique and developing a variety which improves plant production, with an example OR <ul style="list-style-type: none"> Describes plant breeding techniques 	4
<ul style="list-style-type: none"> Outlines aspects of plant breeding and/or resulting desirable plant traits 	2–3
<ul style="list-style-type: none"> Provides some relevant information 	1

Sample answer:

Hybridisation generates superior traits in offspring of two genetically unrelated pure breeding lines as a result of Heterosis. In maize, desired production traits such as yield or quality are identified, and multiple elite lines of plants are generated. Suitable candidates are selected then crossed, tested then propagated before commercial release. A new hybrid variety that meets the original targeted requirement such as corson forage maize with fast maturity and excellent silage characteristics is the result.

Genetic modification via CRISPR (SDN-1) employs 'gene-scissor' technology to quickly target and insert desired genome sequences for desired traits into existing elite lines without compromising high quality traits. The CRISPR maize variety cortevea has had genome sequences inserted for herbicide resistance and production of an insecticidal toxin from a fern for pest resistance. This is a much quicker and more targeted process than the many generations necessary in traditional breeding programs.

Question 27 (a)

Criteria	Marks
<ul style="list-style-type: none"> Outlines strategies for the advertising and/or promotion of the named product 	3
<ul style="list-style-type: none"> Outlines a strategy for the advertising or promotion of the named product 	2
<ul style="list-style-type: none"> Provides some relevant information 	1

Sample answer:

Dairy Australia has consumer marketing campaigns that target customers directly via vibrant TV ads to appeal to families and healthy living. Dairy Australia also delivers a primary school program, 'Discover Dairy', to engage young children in the benefits of dairy foods and the farm-to-plate process.

Question 27 (b) (i)

Criteria	Marks
• Describes how ONE factor affects the supply of the named product	2
• Provides some relevant information regarding the factor	1

Sample answer:

Disease can influence supply of milk. Mastitis reduces the quality and volume of milk produced. Milk with high somatic cell counts due to mastitis can be rejected, reducing the supply available for the market.

Question 27 (b) (ii)

Criteria	Marks
• Describes how ONE factor affects the demand for the named product	2
• Provides some relevant information regarding the factor	1

Sample answer:

Demand for milk can be affected by the availability of alternative products. The increase in availability of non-dairy alternatives like soy and rice 'milks' has reduced the demand for cow's milk.

Question 27 (c)

Criteria	Marks
<ul style="list-style-type: none"> • Demonstrates comprehensive knowledge of management strategies used to meet market specifications for this product • Provides a clear judgement of their value in meeting market specifications 	8
<ul style="list-style-type: none"> • Demonstrates sound knowledge of management strategies used to meet the product's market specifications • Provides some judgement of their value in meeting market specifications 	6–7
<ul style="list-style-type: none"> • Demonstrates comprehensive understanding of a management strategy to meet a market specification for the product and provides a judgement about its value <p>OR</p> <ul style="list-style-type: none"> • Describes management strategies used to meet market specification(s) 	4–5
<ul style="list-style-type: none"> • Describes a management strategy relevant to the product <p>OR</p> <ul style="list-style-type: none"> • Outlines management strategies related to the product <p>OR</p> <ul style="list-style-type: none"> • Provides relevant market specifications for the product 	2–3
<ul style="list-style-type: none"> • Provides some relevant information 	1

Sample answer:

Milk – protein and fat levels in milk are specified by the wholesaler/milk factory and payment to the farmer is adjusted based on this. Milk protein and fat can be manipulated by manipulating genetic and environmental factors. The aim is to do this in an efficient and cost effective way.

Breeding – farmers can select breeding stock based on ABVs for milk fat % and kg. This trait is relatively heritable and improvement via selective breeding is quite successful. While breeding for fat traits can enable a farmer to meet market specifications, this is a very slow process and may take years to achieve. Its only value is a long-term plan to alter fat % or kg. Adding breeds to the herd, eg Jersey that produce higher fat percentages in their milk, is also a way of meeting increased fat percentage requirements in the shorter term however this can be at the expense of milk output and may not be a viable option.

Feeding – managing the nutrition of the animals can also alter protein content of the milk. It is recommended that 13%–16% protein is in the diet, sufficient dry matter to ensure protein consumption and high enough starch and sugar levels for ideal rumen conditions for the microbial protein production. Achieving desired protein levels in milk is much easier and quicker using feeding compared to breeding. However, the cost of feed must not exceed the additional benefits of the manipulated protein level. Manipulation of the cow's diet is the easiest and most viable way to meet market specs for protein.

Section II

Question 28 (a) (i)

Criteria	Marks
• Demonstrates a comprehensive understanding of the need for research in the development of agricultural technologies	4
• Demonstrates a sound understanding of the need for research in the development of agricultural technologies	3
• Demonstrates some understanding of the need for research in the development of agricultural technologies	2
• Provides relevant information	1

Sample answer:

Research into agricultural technologies is important to maintain and improve agricultural production efficiency, sustainability, biosecurity, international competitiveness and profitability. It also helps industry to maintain high yielding crops, disease-resistant varieties of crops and vegetables as well as livestock that remain healthy and avoid pest resistance to chemicals. Without research into genetic improvement, new vaccines, drenches and technology, these requirements will not be able to be met. Research into new technologies is also required to allow greater food security and production on the existing agricultural land farmers have available for production. Research into new technology processes such as CRISPR allows gene manipulation for genetic diseases or gene insertion for controlling desired traits, eg weight gain/better FCR, lower chemical use and input costs, lower soil and water degradation, drought resistance, reduced fossil fuel usage (more biofuels) and methane gas emissions.

Question 28 (a) (ii)

Criteria	Marks
• Provides a comprehensive description of aspects of the research study's methodology	4
• Provides a sound description of aspects of the research study's methodology	3
• Provides an outline of some aspects of the research methodology	2
• Provides a relevant point	1

Sample answer:

The research study 'The power of 28 microsatellite markers for parentage testing in sheep' involved methodologies such as using 3 mobs of ewes with equal numbers of ewes / mobs from independent properties with the control being a flock of ewes from a farm with no known records, thus no bias, and the other two flocks from a CSIRO farm having well-maintained records that represent replication, more chance of bias and human error. Microsatellite DNA markers are tests used to provide accurate pedigree information and to resolve the frequent problem of significant error in pedigrees of Merino sheep. Tissue samples were taken from each sheep ear on multiple occasions, and DNA extracted using scientific extraction processes representing precision and repetition and avoiding human bias with mismatched rams to ewes or lambs to mothers. Error occurs when mothering up ewes and lambs and data recording of sire matings. By using biotechnology, researchers can produce more accurate pedigree records.

Question 28 (b)

Criteria	Marks
<ul style="list-style-type: none"> Provides a comprehensive explanation of how ethical concerns influence the use of biotechnologies in agricultural production using specific and relevant examples Provides a logical and cohesive response 	10–12
<ul style="list-style-type: none"> Provides a sound explanation of how an ethical concern influences the use of biotechnologies in agricultural production, using a relevant example Provides a cohesive response 	7–9
<ul style="list-style-type: none"> Describes how an ethical concern(s) is related to the use of biotechnology(ies) in agricultural production Provides an organised response 	4–6
<ul style="list-style-type: none"> Outlines an ethical concern(s) and/or the use of biotechnology(ies) in agricultural production 	2–3
<ul style="list-style-type: none"> Provides relevant information 	1

Answers could include:

Ethics refers to what is right and wrong as perceived by individuals and based on boundaries that could include humanitarian, legal, environmental, consumer and economic/production considerations.

- Ethical concerns surrounding impact on farming communities – traditional, organic, progressive
- Use of biofuels vs food in a growing world population
- Increasing demand for food production
- Accuracy of food labelling and GM foods
- Distrust of the use of GMOs and CRISPR techniques of gene editing for food
- Poor awareness and experience of long-term use of GMOs on plants, biosecurity, environment and humans
- Maintaining land sustainability and ongoing productivity
- Increased environmental concerns and risks with genetically engineered species crossover with native species
- Poor understanding of development and adoption of biotechnologies
- Push for higher yields and lower input costs
- Sharing of limited resources equitably.

Question 29 (a) (i)

Criteria	Marks
• Demonstrates a comprehensive understanding of the need for research into climate variability or into management strategies for climate variability	4
• Demonstrates an understanding of the need for research into climate variability or into management strategies for climate variability	3
• Demonstrates some understanding for the need for research into climate variability or into management strategies for climate variability	2
• Provides some relevant information	1

Sample answer:

Research into climate variability (or management strategies for climate variability) is important to maintain and improve agricultural production efficiency, sustainability and profitability. It is needed to help support environmentally sustainable management practices and natural resource management. With the effects of climate change – floods, droughts and milder winters – there is great need for research into climate modelling and ways to cope with effects of climate variability. Research into varieties of cereal/pulse and horticultural food crops that are more tolerant to drought, eg stomata behaviour and use of CRISPR gene editing techniques, to aid growth and production in marginal environments helps meet food demands. With growing world populations and demand on food and fibre, farmers need to produce more products on the available land and rely on research to do this and help cope with climatic variability.

Question 29 (a) (ii)

Criteria	Marks
• Provides a comprehensive description of aspects of the research study's methodology	4
• Provides a sound description of aspects of the research study's methodology	3
• Provides an outline of some aspects of the research methodology	2
• Provides some relevant information	1

Sample answer:

In the research study 'GABA signaling modulates stomatal opening to enhance water use efficiency and drought resilience', a hormone GABA is linked to controlling guard cell opening and closing to improve water use and efficiency. The experiment was done under controlled conditions using epidermal guard cells due to easy access by a chemical (GABA) spray stimuli to record effect on pore size. This was repeated with timed photographs taken of stoma aperture width with water stress-imposed trials (control) and with chemical stimulated trials (treatment). This demonstrated treatments while a control and all other conditions (standardisation) were kept constant to reduce error.

Question 29 (b)

Criteria	Marks
<ul style="list-style-type: none"> Provides a comprehensive explanation of management techniques available that minimise risk and maximise opportunities from climate variability using specific and relevant examples Provides a logical and cohesive response 	10–12
<ul style="list-style-type: none"> Provides a sound explanation of management techniques to minimise risk and maximise opportunities from climate variability, using a relevant example Provides a cohesive response 	7–9
<ul style="list-style-type: none"> Describes a management technique(s) can minimise risk and maximise opportunities from climate variability Provides an organised response 	4–6
<ul style="list-style-type: none"> Outlines a management technique(s) to minimise risk and/or maximise opportunities from climate variability 	2–3
<ul style="list-style-type: none"> Provides some relevant information 	1

Answers could include:

Farmers have the option to adopt management techniques to help them manage the variability in climate to help minimise risk and maximise opportunities and these can include:

- Decisions such as which variety of plants to grow
- Improving irrigation practices
- New breeding programs for adaptability of animals to changes in climate in a region
- Holistic grazing which uses high stocking rates in smaller areas to graze the entire range of species in a field. The opportunity to not selectively graze the most palatable and thrifty species for that season will be maximised as well as reducing vegetative groundcover and damaging paddock recovery in the event of a poor season due to drought or lots of rain and waterlogging. This also minimises the risk of stock losing condition and being less productive by managing feed intake and herd health more carefully due to regular contact and observation opportunities with high pressure grazing rotations
- Genetic manipulation and research using new technologies like CRISPR
- Selecting varieties of plants able to withstand heat and saline tolerance
- Advances in breeding research in wheat and barley and technological advances give a better understanding of stomatal behavior and plant hormonal levels (auxins) to help keep stoma open longer. This provides a management technique of choosing tolerant wheat varieties that can help reduce risk to drought exposure periods and help grow the crop in dubious seasons and marginal zones.

Question 30 (a) (i)

Criteria	Marks
• Demonstrates a comprehensive understanding of the need for research in the development of agricultural technologies	4
• Demonstrates a sound understanding of the need for research in the development of agricultural technologies	3
• Demonstrates some understanding of the need for research in the development of agricultural technologies	2
• Provides relevant information	1

Sample answer:

Research into agricultural technologies is important to maintain and improve production efficiency, sustainability, biosecurity, international competitiveness and profitability. Research is needed to help protect industry and communities from the impact of pests and diseases by creating new chemicals and modes of effective pest control, eg Barbervax for internal worm control using rDNA systems. Research is also needed to address animal welfare concerns and help producers improve husbandry practices to satisfy consumer trends and allow more efficient and quality products from animals. For example, sexing chicken embryos and AI straws for dairy calves mean fewer unwanted males are born. Due to an ageing farm population and labour shortages, there is greater need for smart technology to do jobs, eg drones to spot livestock and assist mustering, robotics for shearing, GPS collars and electronic IDs to track weight gain and behaviour monitoring.

Question 30 (a) (ii)

Criteria	Marks
• Provides a comprehensive description of aspects of the research study's methodology	4
• Provides a sound description of aspects of the research study's methodology	3
• Provides an outline of some aspects of the research methodology	2
• Provides some relevant information	1

Sample answer:

The research study 'Using GPS collars to monitor sheep off shears shelter seeking behaviour' involved methodology including monitoring multiple mobs of sheep off shears. The study used the same breed and age of sheep with standardisation occurring by having the same number of sheep of the same breed per paddock per area size. The experiment was done consecutively for two years in the same shelter pattern type paddocks with the same number of data loggers to record diurnal temperatures over the 14-day period off shears. The ewes' movements were tracked with the UNTracker collar every 10 minutes with this data being transferred to advanced computer software. The methodology includes replication as multiple mobs of sheep were used over the two year period.

Question 30 (b)

Criteria	Marks
<ul style="list-style-type: none"> Provides a comprehensive explanation of how new technological developments may assist in agricultural industries using specific and relevant examples Provides a logical and cohesive response 	10–12
<ul style="list-style-type: none"> Provides a sound explanation of how new technological developments may assist agricultural industries using specific examples Provides a cohesive response 	7–9
<ul style="list-style-type: none"> Provides some explanation of how a new technological development(s) may assist agricultural industries using an example Provides an organised response 	4–6
<ul style="list-style-type: none"> Outlines a new technological development(s) that may assist agricultural industries 	2–3
<ul style="list-style-type: none"> Provides relevant information 	1

Answers could include:

Technology assists agriculture by improving efficiency and production. It can be seen in:

- Improved stock surveillance using GPS collars and electronic id chips for biosecurity
- Use of GPS trackers for locating herds, feed intake/FCR efficiency, monitor behaviour
- Use of GPS, satellite technologies and imagery for paddock use/grazing intensities, fertiliser application, tractor guidance/navigation systems for less wastage
- Technology that leads to lower input costs and a greater margin of profit
- The growing area of robotics allows for less reliance on human labour where often it is hard to find suitable labour. However, it is still very much in the developmental stage like robotic shearing where the sheep still need to be forced into a cradle and then manipulated for the robotic shearing to occur. It still needs refining but with the cost of shearing skyrocketing and the difficulty getting shearers it could be an area that lends itself to new technological developments
- Greenhouse monitoring and controls
- Horticultural robots and weed seekers
- Chemical and pharmaceutical developments like vaccines, drenches and pour-ons and herbicides
- Livestock drafting and smart scales.

2022 HSC Agriculture Mapping Grid

Section I Part A

Question	Marks	Content	Syllabus outcomes
1	1	Monocotyledon identification	H2.1
2	1	Photosynthesis	H2.1
3	1	Marketing chain	H3.2
4	1	Animal breeding	H2.2
5	1	Marketing strategies	H3.1
6	1	IPM	H1.1
7	1	Gross margin	H3.2
8	1	Soil characteristics	H2.1
9	1	Value adding	H3.1
10	1	Crop rotation	H2.1
11	1	Government influences	H3.1
12	1	Experimental design	H4.1
13	1	Experimental design	H4.1
14	1	Sustainability tensions	H1.1
15	1	Environmental sustainability	H1.1
16	1	Plant hormones	H2.1
17	1	Experimental design	H4.1
18	1	Fate of energy	H2.2
19	1	Digestion	H2.2
20	1	Design a feed ration	H2.2

Section I Part B

Question	Marks	Content	Syllabus outcomes
21 (a)	3	Soil – decomposition	H2.1
21 (b)	4	Nutrient cycling	H2.1
22 (a)	3	Sustainability – study	H1.1
22 (b)	4	Disease triangle	H2.2
23 (a)	3	Animal physiology and behaviour	H1.1, H2.2
23 (b)	4	Animal ethical issues	H2.2
24 (a)	4	Muscle, fat, bone development	H2.2
24 (b)	4	Animal fertility	H2.2
25 (a)	4	Financial pressures	H3.1, H3.4
25 (b)	6	Marketing strategies	H3.2, H3.4
26	6	Plant breeding techniques	H1.1, H2.1
27 (a)	3	Product study – advertising and promotion	H3.2

Question	Marks	Content	Syllabus outcomes
27 (b) (i)	2	Product study – factors of supply	H3.2
27 (b) (ii)	2	Product study – factors affecting demand	H3.2, H3.4
27 (c)	8	Market specifications	H3.4

Section II

Question	Marks	Content	Syllabus outcomes
28 (a) (i)	4	Research study	H4.1
28 (a) (ii)	4	Research study	H4.1
28 (b)	12	Ethical concerns and biotechnologies	H5.1
29 (a) (i)	4	Research study	H4.1
29 (a) (ii)	4	Research study	H4.1
29 (b)	12	Climate challenge and variability	H5.1
30 (a) (i)	4	Research study	H4.1
30 (a) (ii)	4	Research study	H4.1
30 (b)	12	Technological developments in agriculture	H5.1