

## 2019 HSC Agriculture Marking Guidelines

### Section I, Part A

#### Multiple-choice Answer Key

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

## Section I, Part B

### Question 21 (a)

Criteria	Marks
• Outlines both types of farm business structure	3
• Outlines ONE farm business structure	2
• Provides some relevant information	1

**Sample answer:**

A farm can be family owned where many of the members of the family are involved in the day-to-day activities. Another type of structure is corporate farming which involves a company that owns or manages a farm(s) on a large scale. This type of farming usually has investors and/or shareholders.

### Question 21 (b)

Criteria	Marks
• Outlines TWO strategies that are available to farmers to reduce financial pressure	4
• Outlines ONE strategy that is available to farmers to reduce financial pressure and identifies another	3
• Outlines a strategy that is available to farmers to reduce financial pressure	2
• Provides some relevant information	1

**Sample answer:**

A strategy available to farmers to reduce financial pressure is to diversify production by producing more than one type of product on the farm. Another strategy is to be part of a contract selling system where the farmer gets paid a consistent amount to produce a certain amount of a product.

**Answers could include:**

- Off-farm investment
- Fodder conservation
- Crop Insurance
- Insurance against disaster
- Water conservation using contractors instead
- Seeking a reliable and stable market.

### Question 21 (c)

Criteria	Marks
• Provides points for and/or against the use of direct marketing as a strategy	4
• Describes direct marketing	3
• Outlines direct marketing	2
• Provides some relevant information	1

**Sample answer:**

Direct marketing is directly selling the product to the consumer. This could be as a stall at the front gate or in a shed located on the property. The advantage of this is that it cuts out the intermediary such as an agent who sells the product onto the wholesaler. The farmer can increase the price of the product he sells and receive the profit directly. A disadvantage is that this type of marketing strategy relies on the demand from the consumer. At times there may not be enough buyers for the product and therefore it may have to be disposed of. This means the farmer does not receive any money for the product.

### Question 22 (a)

Criteria	Marks
• Names TWO physical characteristics of soil	2
• Names ONE physical characteristic of soil	1

**Sample answer:**

- Bulk density
- Soil porosity.

**Answers could include:**

- Texture
- Structure.

**Question 22 (b)**

Criteria	Marks
• Provides a detailed and ordered description of an appropriate method	4
• Describes some aspects of an appropriate method	3
• Outlines some aspects of the method	2
• Provides some relevant information about the method	1

**Sample answer:**

Method for texture analysis:

1. Collect a sample of soil, approximately the size of a 50 cent coin.
2. Moisten the soil to the consistency of dough
3. Rub between fingers to determine grittiness
4. Form a ball to check cohesion
5. Roll into a cylinder between your hands and try to form it into a ring.
6. Compare your observations to the texture class key – supplied by the teacher
7. Determine the texture class.

**Answers could include:**

- Structure
- Bulk density
- Porosity
- pH

**Question 23 (a)**

Criteria	Marks
• Sketches in general terms the importance of ongoing research in agriculture	2
• Provides some relevant information	1

**Sample answer:**

Due to the dynamic nature of agriculture, there is a need to constantly research new practices and technologies to cope with change, eg climate change and market preferences.

**Question 23 (b)**

Criteria	Marks
• Provides some characteristics and features of the impact of a named technology on agricultural production and/or marketing	4
• Outlines the impact of the named technology on agricultural production and/or marketing	3
• Describes the named technology	2
• Provides some relevant information	1

**Sample answer:**

Technology = NLIS tags.

The impact of this technology on beef marketing is related to the traceability of an animal from birth to carcase. Traceability can give information to authorities if there is a disease outbreak. Any pesticide residues in the meat can be tracked to an individual farm and remedial action or prosecutions can occur. This traceability means the consumers (especially export markets) have more confidence in the quality of the product and gives Australian beef a competitive advantage.

**Question 24 (a)**

Criteria	Marks
• Provides main features of the impact of the Aboriginal land use practice	3
• Identifies an impact of the Aboriginal land use practice OR	2
• Provides features of how the practice is carried out	
• Provides some relevant information	1

**Sample answer:**

Aboriginal peoples managed the land via management practices such as a light burning in controlled patterns known as 'fire stick farming'. The impact of this is a change of habitat and species composition from denser bush to more open grassland and heath, where species were dependent on, or tolerant of, fire.

**Answers could include:**

- Taking only enough bush food needed for consumption
- Replanting species to ensure future food supply.

### Question 24 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides detailed links between each technique and the sustainable management of soil fertility</li> </ul>	6
<ul style="list-style-type: none"> <li>Links the two techniques to sustainable management of soil fertility</li> </ul> OR <ul style="list-style-type: none"> <li>Links one technique to sustainable management of soil fertility and describes another technique</li> </ul>	4–5
<ul style="list-style-type: none"> <li>Outlines two sustainable soil (fertility) management techniques</li> </ul> OR <ul style="list-style-type: none"> <li>Provides detailed links between ONE technique and the sustainable management of soil fertility</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Identifies a sustainable technique for soil fertility</li> </ul>	1

**Sample answer:**

Conservation tillage reduces the number of times soil is disturbed by ploughing, thereby improving soil structure. Structure can also be improved by the stubble that remains and the organic matter added to the soil. Some nutrients are returned as organic matter decomposes. Improved organic matter improves structure and water-holding ability, and combats soil erosion and compaction.

Green manure cropping involves growing a crop, usually a legume, then ploughing it back into the ground. This increases the organic matter content within the soil and improves soil structure. The chemical fertility of the soil is improved by the addition of nutrients from the legumes and as the organic matter breaks down. This is more sustainable than the use of chemical fertilisers, which can acidify the soil.

**Answers could include:**

- Crop rotation
- Stubble mulching
- Pasture ley phase

### Question 25 (a)

Criteria	Marks
<ul style="list-style-type: none"> <li>Outlines the experimental design including appropriate methodology</li> </ul>	3
<ul style="list-style-type: none"> <li>Outlines some aspects of the methodology of the experiment</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

- 10 pots of lettuce are used
- 5 randomly selected pots are placed in the shade and the other 5 in full sun
- All pots are the same size and same type of soil
- All pots are watered and fertilised the same
- At the end of the trial the lettuce are dried and weighed.

### Question 25 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides links between the management of TWO environmental constraints and photosynthesis</li> </ul>	4
<ul style="list-style-type: none"> <li>Provides links between the management of ONE environmental constraint and photosynthesis</li> <li>Describes the management of a second environmental constraint</li> </ul>	3
<ul style="list-style-type: none"> <li>Describes the management of TWO environmental constraints</li> </ul> OR <ul style="list-style-type: none"> <li>Provides links between the management of ONE environmental constraint and photosynthesis</li> </ul>	2
<ul style="list-style-type: none"> <li>Outlines management of ONE constraint OR the effect of ONE constraint on photosynthesis</li> </ul>	1

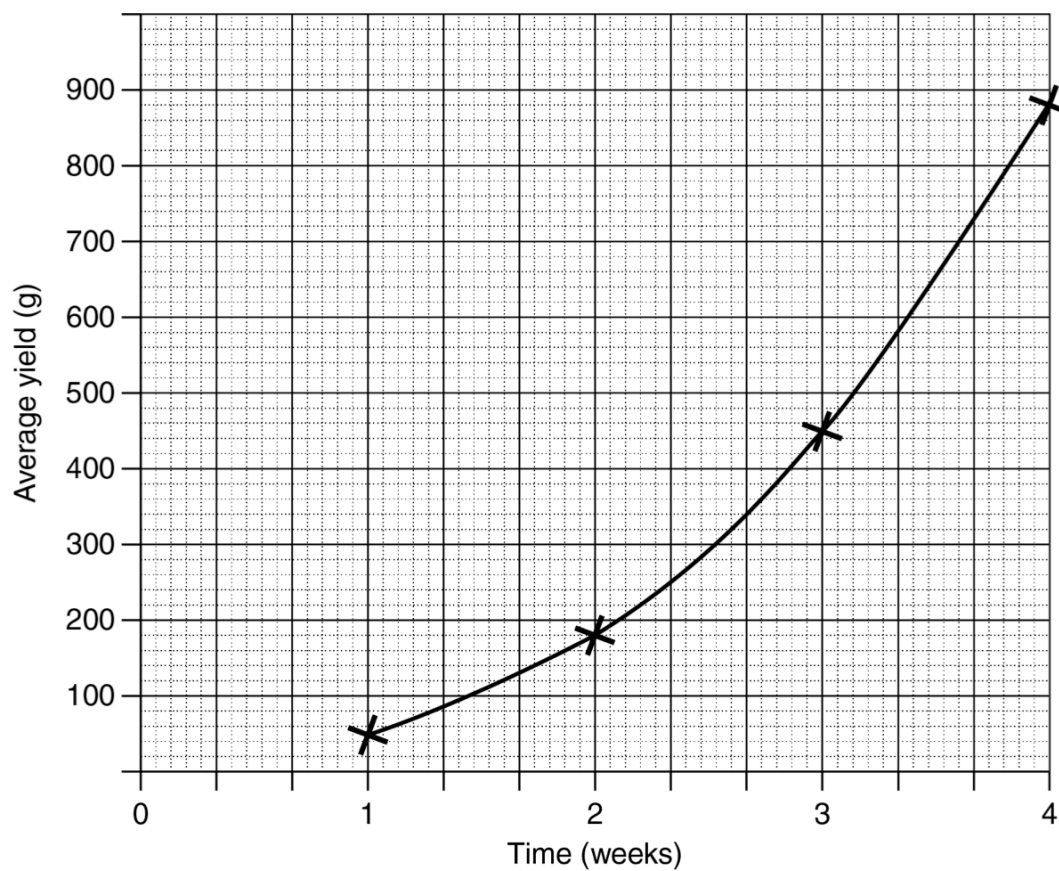
**Sample answer:**

Photosynthesis can be constrained by a lack of the inputs water or light. A farmer can overcome lack of water by using irrigation to supply the correct amount of water in a time that meets the plants needs. Water is used by the plant in the photosynthesis reaction, ie  $\text{CO}_2 + \text{water} \rightarrow \text{carbohydrate} + \text{oxygen}$ . More available water will mean stomates stay open and  $\text{CO}_2$  can enter the leaf. Resulting in more photosynthesis. Correct intensity, duration and quality (wavelength) of light can be adjusted by supplementary lighting, shade cloth or plant density. Too little light constrains photosynthesis and too much light will result in overheating of the leaf.

### Question 25 (c)

Criteria	Marks
<ul style="list-style-type: none"> <li>• Constructs an appropriate graph to represent the data including                             <ul style="list-style-type: none"> <li>– Linear scales (x and y)</li> <li>– Correctly labelled axes</li> <li>– Line graph</li> <li>– Correctly plotted points</li> </ul> </li> </ul>	4
<ul style="list-style-type: none"> <li>• Constructs a substantially correct graph</li> </ul>	3
<ul style="list-style-type: none"> <li>• Demonstrates some understanding of representing data using a graph</li> </ul>	2
<ul style="list-style-type: none"> <li>• Provides some relevant information</li> </ul>	1

**Sample answer:**





## Question 26

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides details of management strategies and how they are used to meet a market specification for a named product</li> <li>Makes a valid judgement on the value of each strategy in meeting the specification for the named product</li> </ul>	6
<ul style="list-style-type: none"> <li>Provides details of management strategies and how they are used to meet a market specification for a named product</li> <li>Provides some judgement about the value of the strategies</li> </ul>	5
<ul style="list-style-type: none"> <li>Provides details of management strategies and how they are used to meet a market specification for the named product</li> </ul>	4
<ul style="list-style-type: none"> <li>Provides details of a management strategy and how it is used to meet market specifications for the named product</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>Describes management strategies relevant to production of the named product</li> </ul>	3
<ul style="list-style-type: none"> <li>Describes a management strategy relevant to production of the named product</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>Outlines management strategies relevant to production of the named product</li> </ul>	2
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

### **Sample answer:**

Milk – Protein levels in milk are specified by the wholesaler/milk factory and payment to the farmer is adjusted based on this. Milk protein can be manipulated by manipulating genetic and environmental factors.

Breeding – farmers can select breeding stock based on ABVs for milk protein, both % and kg values. This trait is relatively heritable and improvement via selective breeding is quite successful. While breeding for protein 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 protein %.

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 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.

### Question 27 (a)

Criteria	Marks
• Provides an outline of the term heritability in relation to animal breeding	2
• Provides some relevant information	1

**Sample answer:**

Heritability is the average proportion of the phenotype of an animal, which is contributed by the genes. The other part of its phenotype is the effect of the environment.

### Question 27 (b)

Criteria	Marks
• Provides a reason why a farmer would choose line breeding	3
• Outlines an advantage of line breeding	2
• Provides some relevant information	1

**Sample answer:**

A stud breeder would choose line breeding as it can concentrate beneficial genetics found in certain bloodlines such as growth rate and muscle development. This is most likely to be undertaken in a stud to improve a particular blood line.

### Question 27 (c)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides comprehensive points for and/or against the use of HGPs in terms of productivity AND animal welfare</li> </ul>	6
<ul style="list-style-type: none"> <li>Provides points for and/or against the use of HGPs in terms of productivity AND animal welfare</li> </ul>	4–5
<ul style="list-style-type: none"> <li>Provides points for and/or against the use of HGPs in terms of productivity OR animal welfare</li> </ul> OR	2–3
<ul style="list-style-type: none"> <li>Describes HGPs</li> </ul>	
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Sample answer:**

Hormone growth promotants are natural or synthetic versions of oestrogen, progesterone or testosterone and combinations of them, which are implanted into an animal in a slow release carrier. The hormones from the implant will change the hormonal state of the animal over a period of up to 100 days and so change its productivity.

The main improvement in productivity is the heavier weight for age achieved by the animal. It will gain up to 100g extra per day over an untreated animal. The treated animal will be leaner and heavier. This extra productivity is offset by market constraints, as an HGP treated animal is of lower meat quality, due to less fat and lower eating quality. Also some of the markets (EU and some domestic supermarkets) will not accept treated animals. Overall for some specific markets, HGPs can prove to be profitable manipulation of the animal.

Animal welfare considerations of HGP treatment include the invasive nature of the application, the changes in behaviour, including aggressive behaviour and the risk of health problems, most notably prolapse of the uterus and rectum. The use of HGPs poses significant animal welfare problems, and the use of them needs to be carefully considered by a producer who wishes to produce lean and heavy animals.

## Section II

### Question 28 (a) (i)

Criteria	Marks
• Outlines the aim of the research study	2
• Identifies an aspect of the research study	1

**Sample answer:**

The aim of the study was to determine if genetically modified rumen microbes prevented poisoning in sheep eating a toxic plant.

### Question 28 (a) (ii)

Criteria	Marks
• Provides thorough justification of TWO aspects of the study methodology and provides support as to the reason for the inclusion/design	6
• Provides sound justification for study methodology elements for one aspect and describes a second element	5
• Provides sound justification of one element of study methodology and supports its inclusion and identifies another aspect	4
• Provides some justification of one aspect of the study methodology OR • Describes features of the study methodology	2–3
• Identifies an aspect of the study methodology	1

**Sample answer:**

In the control group, the sheep were not given an inoculation of the GM microbes. This was to determine the effect of a sub-lethal dose of the toxic plant on untreated animals. It provided a basis of comparison to the treatment group.

The experiment was replicated by using 10 similar animals in the control group and 10 in the group given the GM microbe inoculum. While this number is not very many to ensure a valid result, the minimum possible were used due to the animal welfare issues in administering a toxic treatment.

### Question 28 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides clear and detailed issues and points for and/or against the use of GMOs in food production</li> <li>Provides a logical and cohesive response</li> <li>Uses relevant examples</li> </ul>	10–12
<ul style="list-style-type: none"> <li>Provides some issues and points for and/or against the use of GMOs in food production</li> <li>Provides a mostly logical and cohesive response</li> <li>Includes an example</li> </ul>	7–9
<ul style="list-style-type: none"> <li>Provides some of the issues and points relating to food production using GMOs</li> <li>Provides an organised response</li> </ul>	4–6
<ul style="list-style-type: none"> <li>Outlines an issue relating to food production using GMOs</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Answers could include:**

- Pest resistance to GMOs
- Weed herbicide resistance/superweeds
- Consumer resistance
- Potential health impacts
- Allergies
- Reduction in pesticide use
- Improved food production.

### Question 29 (a) (i)

Criteria	Marks
• Outlines the aim of the research study	2
• Identifies an aspect of the research study	1

**Sample answer:**

The aim was to see the effect of low, variable and normal rainfall on grasslands as a result of climate change induced rainfall variability.

### Question 29 (a) (ii)

Criteria	Marks
• Provides thorough justification of TWO aspects of the study methodology and provides support as to the reason for the inclusion/design	6
• Provides sound justification for study methodology elements for one aspect and describes a second element	5
• Provides sound justification of one element of study methodology and supports its inclusion and identifies another aspect	4
• Provides some justification of one aspect of the study methodology OR	2–3
• Describes features of the study methodology	
• Identifies an aspect of the study methodology	1

**Sample answer:**

Twenty perspex covers were erected over plots of natural pasture. Lateral water movement between plots was limited by soil barriers.

Five replicates of each treatment were randomised across the experimental site at Western Sydney University. This was to remove any site effects such as drainage. The treatments were:

- Natural rainfall
- Same volume of natural rainfall supplied by irrigation
- Half the normal rainfall supplied by irrigation
- Normal rainfall volume but supplied via a once-weekly application.

These treatments were chosen to replicate the possible effects of climate change ie less rainfall and more variable rainfall.

### Question 29 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides clear and detailed issues and points for and/or against management strategies to deal with climate variability</li> <li>Provides a logical and cohesive response</li> <li>Uses relevant examples</li> </ul>	10–12
<ul style="list-style-type: none"> <li>Provides some issues and points for and/or against management strategies to deal with climate variability</li> <li>Provides a mostly logical and cohesive response</li> <li>Includes an example</li> </ul>	7–9
<ul style="list-style-type: none"> <li>Describes strategies farmers can use to deal with climate variability</li> <li>Provides an organised response</li> </ul>	4–6
<ul style="list-style-type: none"> <li>Outlines strategies farmers can use to deal with climate variability</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Answers could include:**

- Changing breeds or varieties
- Changing timing of production
- Moisture conservation practices
- Crop density changes
- Storing water
- Providing stock shade
- Enterprise change
- Fodder conservation.

### Question 30 (a) (i)

Criteria	Marks
• Outlines the aim of the research study	2
• Identifies an aspect of the research study	1

**Sample answer:**

The aim was to determine the effects of milking interval on milk production and quality of the product from the pasture-based Rotary Robotic Dairy.

### Question 30 (a) (ii)

Criteria	Marks
• Provides thorough justification of TWO aspects of the study methodology and provides support as to the reason for the inclusion/design	6
• Provides sound justification for study methodology elements for one aspect and describes a second element	5
• Provides sound justification of one element of study methodology and supports its inclusion and identifies another aspect	4
• Provides some justification of one aspect of the study methodology OR • Describes features of the study methodology	2–3
• Identifies an aspect of the study methodology	1

**Sample answer:**

The control group of cows was milked at standard intervals of 10 and 14 hours to give a basis of comparison to the treatment group of complete volunteer milking.

The experiment was replicated with 20 cows in the control group and 20 cows in the treatment group. The cows were milked for 4 weeks, then had 2 weeks off, then the groups swapped so each treatment/control group had the same 40 cows being treated under the 2 regimes. This allowed for data collection from a sufficient number of animals to ensure valid results.



### Question 30 (b)

Criteria	Marks
<ul style="list-style-type: none"> <li>Provides clear and detailed issues and points for and/or against the impact of a recent technological development. Must include BOTH economic and managerial factors</li> <li>Provides a logical and cohesive response</li> <li>Uses relevant and recent examples</li> </ul>	10–12
<ul style="list-style-type: none"> <li>Provides some issues and points for and/or against the impact of a recent technological development. Must include BOTH economic and managerial factors</li> <li>Provides a mostly logical and cohesive response</li> <li>Includes examples</li> </ul>	7–9
<ul style="list-style-type: none"> <li>Describes the impact of a recent technological development</li> </ul> <p>OR</p> <ul style="list-style-type: none"> <li>Provides issues and points for or against the impact of a recent technological development. Includes EITHER economic OR managerial factors</li> <li>Response is organised</li> <li>Identifies an example</li> </ul>	4–6
<ul style="list-style-type: none"> <li>Outlines a recent technological development</li> </ul>	2–3
<ul style="list-style-type: none"> <li>Provides some relevant information</li> </ul>	1

**Answers could include:**

- Cost of the technology
- Maintenance and operational costs
- Potential financial benefits
- Skills and expertise available for operation
- Improvements to time management
- Better informed decision-making.

# 2019 HSC Agriculture Mapping Grid

## Section I Part A

Question	Marks	Content	Syllabus outcomes
1	1	The marketing chain for a product, p26	H3.2
2	1	Pesticide label, p22	H2.1
3	1	Root nodules on a legume, p21	H2.1
4	1	Integrated pest management, p22	H2.1
5	1	Value adding to a product, p26	H3.2
6	1	Hormone regulation, p23	H2.2
7	1	Proportion of muscle, bone and fat, p23	H2.2
8	1	Using nutritional data, p22	H2.2
9	1	Nutrient cycles, p19	H1.1
10	1	Plant density and yield, p21	H2.1
11	1	Use of plant hormones, p21	H2.1
12	1	Experimental design, p24	H4.1
13	1	Role of objective measurement, p23	H2.2
14	1	Long-term sustainability, p20	H1.1
15	1	Farming practices affecting water, p20	H1.1
16	1	Techniques to manipulate animal growth and development, p23	H2.2
17	1	Ion exchange capacity, p19	H1.1
18	1	Financial pressures on farmers, p25	H3.1
19	1	Diagram illustrating energy losses in digestion, p22	H2.2
20	1	Factors affecting supply/demand, p26	H3.1

## Section I Part B

Question	Marks	Content	Syllabus outcomes
21 (a)	3	Farm business structures, p25	H3.1
21 (b)	4	Financial pressures on farmers, p25	H3.1
21 (c)	4	Marketing options for a product, p26	H3.2
22 (a)	2	Physical characteristics of soil, p19	H1.1
22 (b)	4	First-hand investigation, p19	H1.1
23 (a)	2	Importance of ongoing research, p25	H3.3
23 (b)	4	Recent technologies and impact, p25	H3.3
24 (a)	3	Historical land use practices, p20	H1.1
24 (b)	6	Sustainable management of soil fertility, p20	H1.1
25 (a)	3	First-hand investigation: effect of light, p21	H4.1

Question	Marks	Content	Syllabus outcomes
25 (b)	4	Overcoming environmental constraints on plants, p22	H2.1
25 (c)	4	First-hand investigation: effects of planting density, p21	H2.1
26	6	Management strategies/market specifications, p26	H3.2
27 (a)	2	Factors limiting fertility, p23	H2.2
27 (b)	3	Use of line breeding and crossbreeding, p23	H2.2
27 (c)	6	Management techniques to manipulate production using HGPs, p23	H2.2

**Section II**

Question	Marks	Content	Syllabus outcomes
28 (a) (i)	2	Analyse a research study, p28	H4.1
28 (a) (ii)	6	Analyse a research study, p28	H4.1
28 (b)	12	Using GMOs in agriculture, p27	H3.4
29 (a) (i)	2	Analyse a research study, p31	H4.1
29 (a) (ii)	6	Analyse a research study, p31	H4.1
29 (b)	12	Managing climate variability, p30	H3.4
30 (a) (i)	2	Analyse a research study, p33	H3.4
30 (a) (ii)	6	Analyse a research study, p33	H3.4
30 (b)	12	Impact of a recent technological development, p33	H3.4