BOARD OF STUDIES
NEW SOUTH WALES

2013 HSC Agriculture

Marking Guidelines

Section I, Part A

Multiple-choice Answer Key

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

Section I, Part B

Question 21 (a)

Criteria	Marks
• Outlines a relevant ethical issue	2
• Identifies a relevant ethical issue	1

Sample answer:

Mulesing of sheep causes significant pain and bleeding. This needs to be weighed against the pain and suffering resulting from possible repeated fly strike in unmulesed sheep.

Answers could include:

- Live export of animals
- Battery egg production
- Use of farrowing crates
- Eye tooth removal in piglets
- Beak trimming in poultry
- De-horning

Question 21 (b)

Criteria	Marks
• Identifies an animal husbandry practice and describes in detail two or more factors to reduce negative animal welfare impacts	4
• Identifies an animal husbandry practice and gives some description of two or more factors to reduce negative animal welfare impacts	3
• Identifies an animal husbandry practice and describes one factor to reduce negative animal welfare impacts	2
• Identifies an animal husbandry practice OR • Identifies a method to reduce negative animal welfare impacts	1

Sample answer:

When castrating lambs it is important to restrain them firmly in a lamb marking cradle or with a person holding the lamb so it cannot move freely. The person doing the castration must be adequately skilled and trained and all equipment must be clean and in good working order. Lambs should be returned to their mothers as soon as possible after being castrated.

Answers could include:

- Use of equipment
- Equipment to be in good working order and clean
- Trained/skilled operator
- Timing of practice to consider time of year or time of day
- Management of animals after completing the practice
- Husbandry practices may include drenching, vaccination, castration, shearing, branding etc

Question 22 (a)

Criteria	Marks
• Provides a detailed description of an IPM program used on a pest/disease	4
• Provides an outline of an IPM program used on a pest/disease	3
• Defines the term IPM AND identifies a control method for a pest / disease	2
• Identifies a control method for a pest/disease OR defines the term IPM	1

Sample answer:

Plant/Crop – strawberries
Pest – snails

The IPM program studied involved the control of snails when growing strawberries in the following ways:

Chemical controls – By using snail baits and other chemicals that poison the snails.

Physical control – By physically walking around and picking up and destroying snails in the garden and surrounding area.

Biological control – Encouraging natural populations of blue tongue lizards to populate the area to eat the snails.

Cultural control – Clean up and remove structures that snails can hide and hibernate in. Grow strawberries off the ground so snails find it more difficult to get to them.

Answers could include:

- Cultural control for example crop selection, timing of operations, crop rotation, disease resistant crops, barriers, companion planting
- Biological controls for example natural predators, beneficial insects, pheromones
- Chemical controls for example inorganic and organic pesticides

Question 22 (b)

Criteria	Marks
• Explains how IPM is used to reduce the development of resistant organisms	3
• Outlines how IPM can reduce the problem of chemical resistance	2
• Provides a relevant point in relation to IPM or chemical resistance	1

Sample answer:

IPM uses less chemicals as a control method for pest/disease organisms, ensuring the greatest chance of reducing chemical resistance. Chemical resistance occurs when resistant pest/disease organisms remain alive after treatment and reproduce. The resultant offspring may also be resistant, therefore increasing the population of resistant pest/disease organisms. Using non-chemical alternatives will eliminate these potentially resistant pests.

Question 23 (a)

Criteria	Marks
• Outlines how whole farm planning is related to improving farm sustainability	2
• Provides a relevant point in relation to whole farm planning OR sustainability	1

Sample answer:

Farm sustainability can be improved by using specific areas of the farm according to their capability. For example, it can be used to ensure that only areas with suitable soils and slope are used for cropping, hence reducing soil erosion and siltation of waterways. Steeper slopes are reserved for grazing or revegetation programs.

Answers could include:

- Fencing of riparian zones/waterways
- Windbreaks/shelter belts
- Re-fencing to reflect land capacity

Question 23 (b)

Criteria	Marks
• Clearly relates the effect of the combined efforts via a named program to reduce the potential detrimental effects of agriculture on the environment	4
• Demonstrates a relationship between a named program and a reduction in the environmental impacts of agriculture	3
• Identifies a program involving farmers, government and community members and gives an outline of the operation of the program	2
• Identifies a program involving farmers, government and community members	1

Sample answer:

Farmers acting alone may have limited resources and knowledge to combat damage they may have caused on their farm. By working with government groups and other community members, eg in a land care group, they are more likely to successfully tackle these problems of land and water degradation across a large area. Advice and funding from the government organisations are invaluable in implementing these programs.

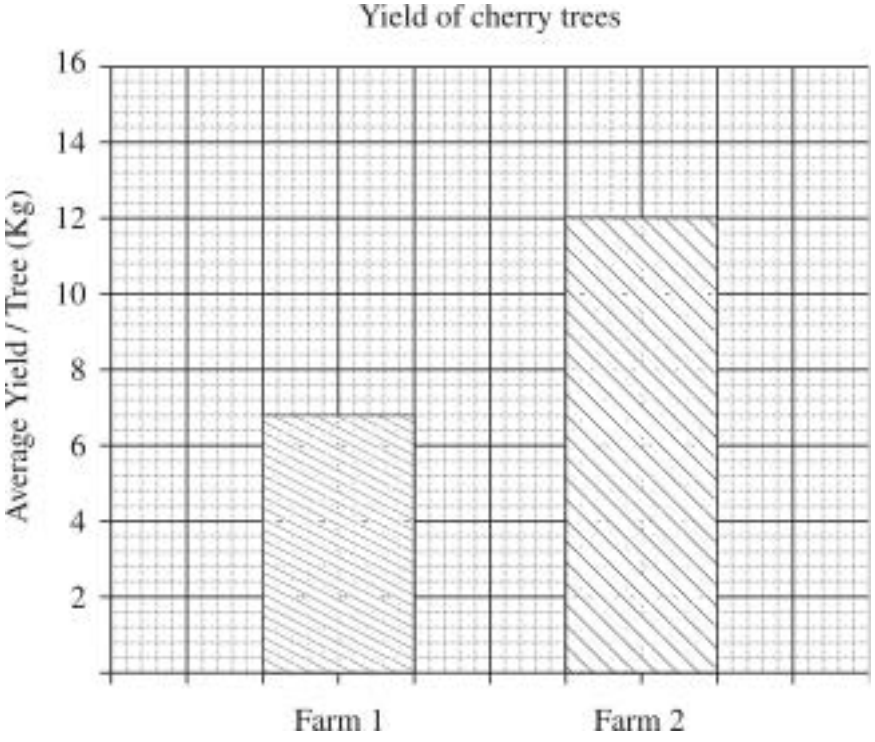
Answers could include:

- Land care
- Bush regeneration
- Integrated Catchment Management
- Rivercare

Question 24 (a)

Criteria	Marks
• Correctly labels the axes on the graph • Uses the correct scale • Correctly construct an appropriate graph	3
• A combination of TWO of the above three features (correct labels on axes, scale and appropriate graph)	2
• Correctly labels the axes OR • Uses the correct scale	1

Sample answer:



Question 24 (b)

Criteria	Marks
• Appropriately evaluates a range of components of experimental design used in this trial	5
• Appropriately evaluates a component of experimental design used in this trial	4
• Outlines components of experimental design used in this trial	3
• Identifies TWO components of experimental design OR outlines a component	2
• Identifies a component of experimental design	1

Sample answer:

The research design used in this trial had many problems. Firstly, there was not enough replication. More cherry trees should have been used in both trial groups. Secondly, the trial was not standardised as the trees used were located in different environments and this could have affected the results.

Question 25 (a)

Criteria	Marks
• Identifies the sources of plant competition, and clearly explains how they affect crop yield	4
• Identifies a source of competition and clearly relates how it affects crop yield	3
• Outlines sources of competition in plants	2
• Identifies a source of competition in plants	1

Sample answer:

Crop yield is affected by competition from weeds and/or the crop planting density. Low planting densities may allow weeds to grow in the crop, competing for light, nutrients and water. This will reduce the crop yield. At very high planting densities competition between the crop plants themselves may affect the reproductive capacity of the plants and restrict crop yield.

Question 25 (b)

Criteria	Marks
• Detailed description of strategies relating to reducing the effects of plant competition	4
• Outlines strategies that a farmer could implement to reduce the effects of plant competition	3
• Identifies some strategies that can reduce the effects of plant competition	2
• Identifies a strategy that can reduce the effect of plant competition	1

Sample answer:

Farmers can reduce the impact of plant competition by ensuring weeds are controlled and planting density is optimised.

Weeds could be controlled by chemical means, by slashing, ploughing or applying mulch. Weeds could also be controlled by strategic grazing. Releasing organisms that attack the weed such as the Patterson's curse beetle could also help reduce weeds and therefore the impact on crop yield.

Farmers need to ensure they follow planting density guidelines for their particular crop and soil combination.

Question 26 (a)

Criteria	Marks
• Provides some details of the effect of nutrition on fertility	2
• Identifies an effect of nutrition on fertility	1

Sample answer:

In female animals poor nutrition may lead to the cessation of oestrus, reduced rates of ovulation and reduced birth weights of offspring. Poor nutrition in male animals usually results in a lower sperm count and reduced libido.

Question 26 (b)

Criteria	Marks
• Provides a detailed evaluation of the use of embryo transfer as a means of manipulating reproduction in farm animals	6
• Provides a limited evaluation of the use of embryo transfer as a means of manipulating reproduction in farm animals OR • Provides a detailed discussion of embryo transfer and how it can manipulate reproduction in farm animals	4–5
• Provides a description/brief discussion of embryo transfer as a reproductive technique OR • Identifies features of embryo transfer	2–3
• Identifies a feature of embryo transfer	1

Sample answer:

Embryo transfer involves taking embryos from one animal and implanting them into the reproductive tract of other animals. The advantages of this include:

- More offspring from genetically superior females
- Ability to choose the sex of offspring
- Embryos can be frozen and stored.

The disadvantages include:

- High cost
- Success is not guaranteed
- There are animal welfare implications
- Requires a skilled operator (technician).

Embryo transfer is particularly valuable for use in stud flocks and herds.

Question 27 (a)

Criteria	Marks
• Outlines a named market specification and clearly articulates problem/s in meeting this market specification for a named farm product	3
• Identifies a market specification AND • Identifies a problem/s in meeting the market specification	2
• Identifies a market specification OR • Identifies a problem/s in meeting a market specification	1

Sample answer:

Farmers may encounter difficulty meeting the required fat cover in beef cattle if there is a drought. The lack of suitable feed to sustain animals on the required plane of nutrition to lay down fat reserves may make it difficult for the farmer to meet market specifications.

Answers could include:

Market specs	*Problems*
Carcase weight	Drought
Eye muscle area	Choice of breed
Micron diameter	Poor nutrition
Protein content %	Poor soil fertility
Bacteria count	Poor storage conditions
Moisture content	Unsuitable harvesting time
Somatic cell count	Disease
Chemical residues	Incorrect chemical application

Question 27 (b)

Criteria	Marks
• Provides a comprehensive description of ways the farm product can be value added	6
• Provides a description of ways the farm product can be value added	5
• Provides a description of a way the farm product can be value added	4
• Outlines ways the farm product can be value added	3
• Outlines a way the farm product can be value added	2
• Identifies a way the farm product can be value added	1

Sample answer:

Raw milk can be changed into a wide variety of consumer products that sell for a higher price. Cheeses are made by adding specific bacteria to the milk and incubating it so that the milk proteins coagulate to form solids. These are separated to form the cheese. Powdered milk is made by dehydrating pasteurised liquid milk before packaging it. Flavoured milks are made by adding various flavouring agents to milk during processing.

Answers may include:

- Processing wool into yarn
- Creating niche markets
- Producing allergen free products
- Selling a processed product from the farm gate or at community markets

Question 28 (a)

Criteria	Marks
• Names a technical advance and outlines how it affects production and/or marketing of a farm product	2
• Lists an effect OR • Names a technological advancement	1

Sample answer:

1. Large-scale ultrasound scanning of sheep allows farmers to identify barren ewes thus allowing them to cull any ewe not pregnant. The culling of these animals will result in lower cost of production as empty ewes will not be present to add to grazing pressures or use consumables such as drench.
2. DNA testing of dairy cows allows those cows that have the A2 beta casein gene to be identified. These cows can be milked separately from the main herd. The A2 milk can be sold into a niche market to increase the farmer's returns.

Answer could include:

- Eye muscle area scanning
- Drought tolerant crops
- Round-up ready crops
- GM crops
- NLIS tags
- Semen sexing

Question 28 (b)

Criteria	Marks
• Comprehensively discusses a range of strategies available to farmers to market their products	6
• Outlines a range of strategies available to farmers to market their products	5
• Discusses in detail a strategy available to farmers to market their product	4
• Outlines a strategy available to a farmer to market their product	3
• Identifies some strategies available to a farmer	2
• Identifies a strategy available to a farmer to market their product	1

Sample answer:

Farmers may choose to vertically integrate to improve profitability. For example, a vigneron may grow grapes and make wine selling the wine to either a wholesaler or at a cellar door on the farm. This assists in controlling the sale price and overall returns.

Farmers may choose to join together to form a marketing cooperative. This cooperative may increase their bargaining power and possibly allow access to new markets unavailable to a single farmer. The increased total volume of product for sale when farmers combine together may allow for a marketing strategy such as quality guarantee to be used.

Answers could include:

- Vertical integration
- Contract selling
- Forward selling
- Niche markets
- Direct marketing
- Cooperatives
- Marketing boards
- Farmers markets
- Computer assisted marketing

Section II

Question 29 (a) (i)

Criteria	Marks
• Clear explanation for research into agri-foods, fibre and fuels	3
• Limited explanation for research into agri-foods, fibre and fuels	2
• Identifies a need for research into agri-foods, fibre and fuels	1

Sample answer:

As the world population increases, the need for food, fibre and fuel will also increase. Ongoing research is essential to meet this growing demand, and to also meet this demand on limited growing areas (urban sprawl). The research will provide us with alternative fuel sources to replace/complement fossil fuels and produce more food/fibre in more efficient ways.

Answers could include:

- The need to replace fossil fuels.
- Increasing and changing consumer demands as population increases.
- Increasing efficiency requirements regarding resources.

Question 29 (a) (ii)

Criteria	Marks
• Logical explanation of how biosecurity relates to the protection of agricultural industries and includes well supported examples	5
• Explains how biosecurity relates to the protection of agricultural industries with the use of an example/s	4
• Explains how biosecurity helps protect Australia's agricultural industries	3
• Outlines of the role of biosecurity	2
• Makes a relevant point about biosecurity	1

Sample answer:

Australian agriculture is unique due to the fact that our products are free from many exotic diseases found in other countries. Biosecurity protects us from these exotic diseases entering and affecting our products meaning consumer confidence (nationally and internationally) is high and subsequently demand remains high. This means our markets are more secure, protecting our agricultural industries into the future.

For example, live poultry and eggs cannot be imported into Australia because of the risk of introducing Newcastle's Disease.

Answers could include:

- Border protection
- Prevent entry of exotic pests/diseases eg Newcastle's Disease, Foot and Mouth Disease
- Protection of export markets
- Ensuring organisms used in research don't escape into the environment

Question 29 (b)

Criteria	Marks
• Demonstrates extensive knowledge and deep understanding of the impact of specific recently introduced technologies • Response is logical and cohesive throughout • Addresses in detail the conflict between increased production and ethical concerns relating to biotechnology innovation	10–12
• Demonstrates extensive knowledge and deep understanding of the impact of specific recently introduced technologies • Response is logical and cohesive throughout • Addresses in detail the conflict between increased production and ethical concerns relating to biotechnology innovation	7–9
• Demonstrates limited knowledge and understanding of the impact of recently introduced technologies • Response is organised • Outlines the conflict OR a relevant point	4–6
• Limited outline of the conflict between increased production and ethical concerns OR • Identifies a conflict OR a relevant point	1–3

Answers could include:

- Decreasing land available for agriculture
- Increasing world population
- Increasing demand for food production
- Lack of understanding of GMOs
- Increased need for labelling requirements
- Lack of trust of GMOs
- Need for increased yields
- Increased environmental concerns
- Increased need for sustainability
- Overuse of chemicals
- Food allergies
- Lack of information on the possible damage of GMOs to the human body
- Finite resources

Question 30 (a) (i)

Criteria	Marks
• Clear explanation of the need for research into climate variability	3
• Limited explanation of the need for research into climate variability	2
• Identifies a need for research into climate variability	1

Sample answer:

Research into climate variability is essential to determine current trends and the predicted future climatic patterns. This allows farmers to better prepare for climatic changes and adjust their agricultural practices accordingly. This could be to better cope in changing climates through species selection or the research could determine what farming practices should be used to reduce negative impacts on Australian agriculture resulting from climatic variability.

Answers could include:

Changing climate requires a change in agricultural practices. This better prepares farmers for the future in coping with climate. Informs farmers of agricultural practices contributing to negative climate variability, eg increased greenhouse gas emissions.

Question 30 (a) (ii)

Criteria	Marks
• Provides a detailed description of methods available to trade water resources	5
• Provides a description of methods available to trade water resources	4
• Provides a limited description of methods available to trade water resources OR • Provides a detailed description of a method available to trade water resources	3
• Outlines a method available to trade water resources	2
• Identifies a method available to trade water resources OR • Makes a relevant point	1

Sample answer:

Options available for farmers to trade water resources include trading:

- Water access entitlements
- Water allocation
- Riparian rights
- Stock – domestic rights
- Water delivery rights
- Irrigation rights.

Farmers may use a registered water broker to trade water resources or register and trade themselves, independently. In trading water resources the key steps include:

- Investigating the market and reviewing supply and demand
- Determine the trading rules – procedures for the water resource and state/district legislation
- Matching offers for buying and selling
- Draw up contractual agreements between parties
- Perform trade/settlement with payment and register the trade.

Answers could include:

Licence trading (seasonally/annually), permanent and temporary trading, trading interstate, trading through registered water brokers.

Question 30 (b)

Criteria	Marks
• Demonstrates extensive knowledge and deep understanding of how nitrogen fertiliser AND intensive ruminant production contribute to greenhouse gas emissions • Response is logical and cohesive throughout	10–12
• Demonstrates knowledge and understanding of how nitrogen fertiliser AND intensive ruminant production contribute to greenhouse gas emissions • Response is mainly logical and cohesive	7–9
• Demonstrates limited knowledge and understanding of how nitrogen fertiliser AND intensive ruminant production contribute to greenhouse gas emissions OR • Demonstrates knowledge and understanding of how nitrogen fertiliser OR intensive ruminant production contributes to greenhouse gas emissions • Response is organised	4–6
• Identifies how nitrogen fertiliser AND/OR intensive ruminant production contributes to greenhouse gas emissions OR • Makes a relevant point	1–3

Answers could include:

Nitrous oxide released into the atmosphere via
- Mineralisation
- De-nitrification
- Volatisation

Ruminant digestion producing methane via the process of rumination
- Action of methanogens
- Enteric fermentation

Question 31 (a) (i)

Criteria	Marks
• Provides a clear explanation for research into farming for the 21st century	3
• Provides some explanation for research into farming for the 21st century	2
• Identifies a need for research into farming for the 21st century	1

Sample answer:

Agriculture is dynamic and ever changing due to changes in climate variability and increases in world population. To keep pace with these changes, research into agricultural technologies is essential. This will allow farmers to maintain productivity as input costs rise, to incorporate practices with reduced environmental impacts and to keep producing food in an efficient manner to feed a growing population on an ever decreasing area of land.

Answers could include:

- Economic and environmental sustainability
- Changing consumer demand (new products)
- Increasing input prices may require research to find cheaper alternatives
- Application of newly developed technology into agricultural production and/or marketing

Question 31 (a) (ii)

Criteria	Marks
• Describes in detail at least TWO R&D issues relating to farming for the future	5
• Provides limited description of at least TWO R&D issues relating to farming for the future	4
• Provides a detailed description of ONE R&D issue	3
• Outlines a range of issues relating to farming for the future	2
• Identifies an issue	1

Sample answer:

There are many issues related to R&D of technologies in agriculture for the future. Funding is one issue. R&D requires a lot of funding when often the outcome is not clear financially, environmentally etc until further research is carried out. To find appropriate long term funding can be an issue.

Another issue for R&D into new technologies might be patenting. The R&D cannot be on something that has already been patented, otherwise litigation is an issue. When R&D has found a new technology that has value it should be patented quickly so that economic rights to this technology are secured when it is finally developed.

Answers could include:

- Patents
- Plant breeders rights
- Animal welfare
- Legislation
- Contracts
- Funding sources

Question 31 (b)

Criteria	Marks
• Demonstrates extensive knowledge and deep understanding of the impact of specific recently introduced technologies • Response is logical and cohesive throughout • Addresses in detail the benefits of recent developments in both biotechnology and robotics and how they have assisted agricultural production	10–12
• Demonstrates knowledge and understanding of the impact of specific recently introduced technologies • Response is mainly logical and cohesive • Gives some detail of the benefits of recent developments in both biotechnology and robotics and how they have assisted agricultural production	7–9
• Demonstrates limited knowledge and understanding of the impact of recently introduced technologies • Response is organised • Outlines some benefits of recent developments in either biotechnology or robotics OR • Gives some detail of the benefits of recent developments in either biotechnology or robotics and how they have assisted agricultural production	4–6
• Identifies some benefits of recent developments in either biotechnology or robotics OR • Makes a relevant point	1–3

Answers could include:

Robotic Dairy:
- Decrease mastitis
- Increase milk production
- Free up farmers to complete other jobs
- Reduce labour costs

Robotic Shearing:
- Reduce labour
- Increased accuracy

Biotechnology:
- Increase yield
- Increase returns
- Increase product availability
- Decrease reliance on chemicals
- A2 milk
- Round up resistant cotton/canola
- AMO Soybean
- Bollguard cotton

Agriculture

2013 HSC Examination Mapping Grid

Section I
Part A

Question	Marks	Content	Syllabus outcomes
1	1	Historical land use (pg 20)	H1.1
2	1	Animal reproduction and genetics (pg 23)	H2.2
3	1	Plant production systems soil nutrients & water (pg 19)	H2.1
4	1	Animal ethics and welfare (pg 24)	H1.1
5	1	Animal reproduction and genetics (pg 23)	H2.2
6	1	Plant production systems – pastures (pg 21)	H2.1
7	1	Experimental design (pg 24)	H4.1
8	1	Animal reproduction and genetics (pg 23)	H2.2
9	1	Management and IPM (pg 22)	H2.1
10	1	Animal reproduction and genetics (pg 23)	H2.2
11	1	Plant production systems (pg 21)	H2.1
12	1	Animal reproduction and genetics (pg 23)	H2.2
13	1	Animal reproduction growth & development (pg 23)	H2.2
14	1	Experimental design (pg 24)	H4.1
15	1	Decision making process & management (pg 25)	H1.1
16	1	Animal reproduction growth & development (pg 23)	H2.2
17	1	Animal digestion (pg 24)	H2.2
18	1	Plant production system (pg 21)	H2.1
19	1	Soil nutrients and water (pg 19)	H2.1
20	1	Experimental design (pg 24)	H1.1

Section I
Part B

Question	Marks	Content	Syllabus outcomes
21 (a)	2	Animal ethics and welfare (pg 24)	H2.2
21 (b)	4	Animal ethics and welfare (pg 24)	H2.2
22 (a)	4	Evaluate an IPM program (pg 22)	H2.1
22 (b)	3	Chemical resistance – managing plant production (pg 22)	H2.1
23 (a)	2	Assess the factors… whole farm planning (pg 20)	H1.1
23 (b)	4	The role of individual farmers (pg 20)	H1.1
24 (a)	3	Experimental analysis (pg 24)	H4.1
24 (b)	5	Experimental analysis (pg 24)	H4.1
25 (a)	4	Constraints on plant production (pg 21)	H2.1
25 (b)	4	Constraints on plant production (pg 21)	H2.1
26 (a)	2	Animal reproduction and genetics (pg 23)	H2.2

Question	Marks	Content	Syllabus outcomes
26 (b)	6	Animal reproduction and genetics (pg 23)	H2.2
27 (a)	3	Farm product study – marketing a specific farm product (pg 26)	H3.2
27 (b)	6	Farm product study – marketing a specific farm product (pg 26)	H3.1
28 (a)	2	Agriculture technology (pg 25)	H3.3
28 (b)	6	Marketing (pg 25)	H3.2

Section II

Question	Marks	Content	Syllabus outcomes
29 (a) (i)	3	Agrifood fibre and fuel technologies – research methodology (pg 28)	H4.1
29 (a) (ii)	5	Agrifood fibre and fuel technologies – managing processes in agricultural systems (pg 28)	H5.1
29 (b)	12	Agrifood fibre and fuel technologies – innovation, ethics and current issues (pg 28)	H5.1
30 (a) (i)	3	Climate Challenge – research methodology (pg 31)	H4.1
30 (a) (ii)	5	Climate Challenge – managing processes in agricultural systems (pg 30)	H3.4
30 (b)	12	Climate Challenge – innovation, ethics and current issues (pg 30)	H3.4
31 (a) (i)	3	Farming in the 21st Century – research methodology (pg 33)	H4.1
31 (a) (ii)	5	Farming in the 21st Century – innovation, ethics and current issues (pg 32)	H5.1
31 (b)	12	Farming in the 21st Century – innovation, ethics and current issues (pg 32)	H3.4, H5.1