



## 2010 Food and Technology GA 3: Written examination

### GENERAL COMMENTS

The 2010 examination assessed students' knowledge and understanding of Unit 3, Areas of Study 1, 2 and 3, and Unit 4, Areas of Study 1, 2 and 3. All key knowledge and skills that underpin the outcomes were assessable.

The seven examination assessment criteria listed on page 23 of the *Food and Technology Assessment Handbook* were drawn from the six Areas of Study. The paper consisted of seven short answer questions that were based on the criteria.

This report should be read in conjunction with the 2010 Food and Technology examination paper.

### Strengths and weaknesses

#### Strengths

- understanding the role of market research
- understanding the requirements of labelling
- understanding the considerations and constraints found within a design brief
- explaining the difference between primary and secondary processing
- demonstrating an understanding of health and safety practices in food storage and preparation
- demonstrating an understanding of correct personal hygiene practices in food preparation and processing
- understanding terminology such as cross contamination, danger zone, line extension and target market
- understanding the effect of packaging on the environment
- understanding the preserving method of dehydration
- understanding the difference between batch and continuous production systems and their benefits to the manufacturer
- understanding the system of Modified Atmosphere Packaging (MAP) and the benefits of this system for the manufacturer
- understanding the social factors that lead to the development of foods suitable for use in a microwave oven
- understanding the role of corrective actions in preventing hazards in food preparation and processing

#### Weaknesses

- providing answers that were irrelevant or not directly related to the questions asked
- not giving examples for specific questions when required
- not reading the information provided in the question and relating the answer to this information
- not understanding new technological developments in the food industry
- not understanding what constitutes a 'functional food' and a 'health claim'
- not understanding and describing environmental issues in food production and their impact on the environment
- not understanding strategies used to address these environmental issues and their economic advantage to the primary producer
- not defining the process of plant breeding or explaining the advantages of using this process for the food producer
- not explaining the responsibilities of Food Standards Australia New Zealand (FSANZ) and their role in developing the Food Standards Code
- not explaining the Hazard Analysis and Critical Control Point (HACCP) system and its role in ensuring safe food production
- not explaining functional roles of the natural components found in key foods in food preparation and processing
- not defining the aseptic packaging system and the advantages of using this system
- not understanding the role of packaging
- not explaining complex processes used in food production
- not identifying and describing both wet and dry methods of cooking
- not understanding the difference between food spoilage and food poisoning
- not understanding terms used in the study design; for example, strategies, sensory properties, product development, functions and genetic modification
- not understanding and explaining the key steps in primary processing of vegetables



**SPECIFIC INFORMATION**

**Note: Student responses reproduced herein have not been corrected for grammar, spelling or factual information.**

For each question, an outline (or answer) is provided. In some cases, the answer given is not the only answer that could have been awarded marks.

**Question 1a.**

Marks	0	1	2	Average
%	21	40	39	<b>1.2</b>

Two ways that Chang’s may have carried out market research include:

- surveys conducted at a supermarket or shopping centre, or by phone
- market reports on sales to find a gap in the current market
- current market trends – development of a ‘me too’ for market share
- research on customer buying patterns – food sensitivity/convenience.

An answer that simply stated ‘market research’ did not receive any marks.

**Question 1bi and 1bii.**

Marks	0	1	2	Average
%	5	21	74	<b>1.7</b>

**1bi.**

A suitable response to explain the term ‘target market’ would have been: A group of consumers who share common needs and who the manufacturer determines will be the focal point for marketing their product.

**1bii.**

In responding to this question, students needed to refer to information on the packaging. A suitable target market for the noodles could have included any of the following:

- people who are allergic to gluten
- people who follow a vegetarian diet
- consumers who wish to control the amount of fat in their diet and use a fat-free product
- consumers who wish to use wok-ready noodles in their cooking to save time.

**Question 1c.**

Marks	0	1	2	Average
%	20	46	35	<b>1.2</b>

A suitable response could have been: The design brief is the focal point of the design process. A detailed design brief should outline the aims or intentions of the project and will contain all the specifications or considerations and constraints that need to be followed. These may be related to ingredients to be used, target market or the marketing of the product, etc.

**Question 1d.**

Marks	0	1	2	Average
%	8	8	84	<b>1.8</b>

A suitable response could have included two of the following specifications:

- the noodles need to be suitable for use by people who cannot eat gluten
- the noodles need to be ready to add to a wok without additional preparation or cooking
- the noodles need to be packaged in small amounts
- the noodles need to be suitable for vegetarians
- the product should be low in fat.

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## Question 1e.

Marks	0	1	2	Average
%	27	38	35	1.1

Suitable responses could have included two of the following reasons why the development of the prototype was an important stage:

- allows testing the accuracy of proportion/quantity/type of ingredients used in recipe
- enables production system to be trialled
- determines the skill level of staff and would show any retraining that may be required
- sensory properties of the new noodles could be assessed
- cost of production can be assessed
- proposed packaging, labelling and shelf life of the noodles can all be assessed
- amount of wastage created during production can be assessed
- allows for the checking of equipment to be used in the manufacture of the noodles.

## Question 1f.

Marks	0	1	2	3	4	Average
%	10	12	42	15	23	2.3

Suitable responses could have included two of the following social factors that have led to the increase in foods suitable for cooking in a microwave oven:

- cultural diversity – an increase in the proportion of people of Asian descent in the population and therefore a greater awareness and popularity of Asian foods
- international travel – a greater awareness and popularity of Asian foods
- working families – many families now have both partners working full or part time or are time poor so convenience products are desirable
- ageing population – many older consumers live alone and may seek products that are packed in small sizes; the noodles may address health concerns, for example, low in fat
- younger generation – with busy lifestyles that require quick, convenient foods
- diet and good health – greater awareness of the link between food consumption and health, consumers seeking alternative foods to cope with their dietary needs and food sensitivities or they may be vegetarians
- income availability – families with a limited income may choose food products that are cheaper than take-away foods or eating out.
- limited food preparation skills – fewer people have skills handed down from generation to generation and so rely on pre-prepared products.

Students needed to clearly identify a social factor and then describe how this factor may have led to the development of foods suitable for cooking in a microwave oven.

## Questions 1gi and 1gii.

Marks	0	1	2	3	Average
%	16	28	34	23	1.7

### 1gi.

A suitable response to outline the system of modified atmosphere packaging would have been: MAP is a packaging system that changes or modifies the atmosphere inside a package in order to extend the shelf life of food.

### 1gii.

Suitable responses could have included two of the following reasons for the use of MAP packaging system. The system:

- reduces microbial activity
- preserves the natural texture, colour, flavour and moisture of the food
- prevents the browning of food
- extends the shelf life of the packaged food
- reduces waste
- increases the convenience of the food.

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## Question 2a.

Marks	0	1	2	Average
%	57	35	8	<b>0.5</b>

A suitable response to describe two advantages of using the process of plant breeding to a food producer could have been: The chosen (trait) characteristics of one plant are transferred into another plant of the same species in a laboratory environment.

This question was poorly answered. To gain two marks, students needed explain that the process takes place in a laboratory environment.

The following is an example of a high-scoring response.

*Plant breeding involves splicing the desirable characteristics or traits of one plant into another plant of the same species to improve its characteristics and this is done in a laboratory.*

## Question 2b.

Marks	0	1	2	Average
%	36	41	22	<b>0.9</b>

Suitable responses could have included two of the following:

- the process of plant breeding prevents any undesirable traits being transferred
- it is a quicker and more accurate process than traditional plant breeding
- it is not genetically modified and may be more acceptable to consumers, therefore providing an economic advantage to the producers as consumers will purchase the broccolini
- the Broccolini® Baby Broccoli has improved physical and sensory properties and therefore may have greater market potential.

This question was poorly answered.

The following is an example of a good response to this question.

*The process is more effective and faster than traditional plant breeding and a new product is made so the variety for the consumer is increased, therefore profits for the producer may be greater.*

## Question 2c.

Marks	0	1	2	3	4	Average
%	21	11	31	9	28	<b>2.2</b>

Suitable responses could have included two of the following key steps in the primary processing of vegetables:

- grading – poor quality vegetables are removed; vegetables are graded according to size, maturity or colour so consumers get a consistent product
- packing – vegetables may be packed in polystyrene crates and chilled to retard the ripening process so they arrive to consumers in peak condition
- storage – vegetables are stored in cool rooms to limit the respiration rate and keep them fresh and crisp for sale to consumers
- transportation – vegetables are transported in refrigerated trucks to markets and supermarkets to reduce water loss, ensuring they have a longer shelf life.

Students needed to identify the step and explain how the step would ensure that consumers receive vegetables in peak condition.

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## Question 2d.

Marks	0	1	2	Average
%	28	39	33	1.1

A suitable response to explain how secondary processing of vegetables differs from primary processing could have been: Primary processing is the processing that occurs after the broccolini is harvested, to make it safe to consume or ready for use in other food products; for example, sorting, cleaning, grading or transporting the broccolini to the retailer for sale. In comparison, secondary processing changes primary processed foods into other food products, either on their own or mixed with other ingredients; for example, frozen broccolini or vegetable frittata.

Students needed to make a comparison between the two types of processing to gain full marks.

## Question 2ei–iii.

Marks	0	1	2	3	4	5	Average
%	5	9	18	27	24	16	3.1

### 2ei.

A suitable response could include one of the following hazards when storing ingredients for the frittata and related corrective actions.

Hazard	Corrective action
Ingredients could be stored incorrectly	<ul style="list-style-type: none"> <li>perishable foods – eggs, bacon, milk and broccolini must be stored in the refrigerator at 2–5 °C to prevent the growth of microorganisms</li> <li>potatoes and onions should be stored in a cool, dry, dark pantry, not in the refrigerator. They should be off the floor and in a suitable container</li> </ul>
Refrigerator may be malfunctioning	<ul style="list-style-type: none"> <li>check the temperature of the refrigerator every day to ensure that it is operating at, or below, 5 °C</li> </ul>
Perishable ingredients could be past their ‘use-by’ or ‘best-before’ date	<ul style="list-style-type: none"> <li>check the use-by date of eggs, bacon and milk to ensure they are not out of date</li> <li>rotate stock – first-in, first-out</li> </ul>
Vegetables could be starting to spoil	<ul style="list-style-type: none"> <li>check the potatoes to see if they have any signs of spoilage and discard any vegetables that have begun to spoil                             <ul style="list-style-type: none"> <li>– potatoes may have begun to sprout or have a green tinge, indicating the presence of solanine</li> <li>– broccolini – wilted</li> <li>– onions – soft patches or mould</li> </ul> </li> </ul>
Egg shells may be cracked	<ul style="list-style-type: none"> <li>check eggs before use for any signs of cracking and discard any that are damaged</li> </ul>

### 2eii.

A suitable response could have included one of the following corrective actions to prevent cross contamination:

- use separate boards for preparing vegetables and bacon, or wash boards thoroughly before preparing each ingredient
- wash knives thoroughly between each preparation step
- keep work surfaces and equipment clean
- practise personal hygiene to prevent cross contamination; for example, washing hands after using the toilet, blowing nose, etc.
- remove ingredients from the refrigerator just before preparing; put back into refrigerator after cutting/before cooking.

### 2eiii.

A suitable response could have been:

- the danger zone is the temperature between 5 °C and 60 °C (or above 4 °C and below 60 °C) when bacteria are able to grow and reproduce
- one action the manufacturer could take to prevent this hazard is to cool the frittata rapidly once cooked, then store in the refrigerator below 5 °C.

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## Questions 3ai and 3aii.

Marks	0	1	2	3	4	Average
%	18	26	22	16	18	1.9

### 3ai.

This question was answered poorly. A suitable response could have been: The process of aseptic packaging involves sterilising both the liquid and the packaging, and filling and sealing the stock in a sterile environment.

The following is an example of a good student response to 3ai.

*Aseptic packaging involves packaging sterile liquid or semi-liquid foods such as beef stock, into a sterile package in a sterile environment. After packaging it is sealed and does not need to be refrigerated until it is opened.*

### 3aii.

Advantages of using aseptic packaging include (two of):

- no preservatives need to be added to the stock
- natural flavour and colour are retained
- nutrients are retained
- no refrigeration is required until opened
- convenience
- extend the shelf life of the stock
- time saving – just open and use.

The following is an example of a good response to 3aii.

*The food is cheaper to transport because refrigerated vehicles are not needed.*

*The shelf life of the food is extended and the quality of the food remains high for a longer period of time.*

## Questions 3bi and 3bii.

Marks	0	1	2	3	4	Average
%	7	18	34	24	16	2.3

### 3bi.

A suitable response could have included one of the following dry methods:

- frying (sautéing onion or browning minced meat) – frying is cooking food by partially or totally immersing the food in oil that is heated to 150 °C to 220 °C, or frying is a quick dry method of cooking food in oil
- baking (to bake pastry or brown the cheese on the potato topping) – cooking food in an oven without the addition of fat or oil; it requires convection rather than radiant heat.

The following is an example of a good student response to 3bi.

*Baking – is cooking food by convection rather than radiation. The meat pie is baked in the oven.*

### 3bii.

A suitable response for 3bi. included one of the following wet methods of cooking:

- simmering the meat filling – simmering is not true boiling but cooking at a lower temperature of 85 °C, which allows bubbles to rise slowly to the surface
- simmering is a method of cooking in a liquid that is slightly below boiling point
- boiling the potatoes is cooking food in a liquid at 100 °C; produces bubbles all over the surface of the pan
- steaming the potatoes is cooking food in the steam from boiling liquid.

Microwaving is not a wet method of cooking.

The following is an example of a good response to 3bii.

*Simmering- is usually when food is covered fully or partially in a liquid or stock and bubbles rise to the surface occasionally – the temperature is below boiling point. The meat mixture is simmered for 20 minutes.*

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## Questions 3ci and 3cii.

Marks	0	1	2	3	4	5	6	Average
%	29	9	14	14	15	10	9	2.4

A suitable response could have included the following.

	Butter for the pastry	Minced steak for the filling
Natural food component	Fat	ProteinFat
Impact on preparation and processing	<ul style="list-style-type: none"> <li>Rubbed-in butter coats starch grains in flour, separating the gluten strands, giving a crisp shortening effect when baked.</li> <li>After baking to produce a rich flavour, the rubbed-in butter melts during baking, creating a crisp, smooth mouth feel when eaten.</li> <li>The butter will give a golden colour to the baked pastry when cooked.</li> </ul>	<ul style="list-style-type: none"> <li>Denaturation – muscle fibres contract, meat shrinks and changes colour from red to grey. Meat changes from being soft to firm.</li> <li>Fat melts during cooking, adding flavour and aroma.</li> </ul>

One mark was awarded for each of the natural food components identified, and two marks for the impact of the natural food component on preparation and processing. Students did not answer this question well.

The following is an example of a good response.

	<i>Butter for the pastry</i>	<i>Minced steak for the filling</i>
<i>Natural food component</i>	<i>Fat</i>	<i>Protein</i>
<i>Impact on preparation and processing</i>	<i>When the butter is rubbed in it coats the starch granules which allows the pastry to develop a short texture by stopping the gluten in the flour from developing.</i>	<i>When the meat is cooked the collagen breaks down to gelatin and the protein denatures, therefore causing it to shrink and the meat to change colour from red to grey</i>

## Questions 3di. and 3dii.

Marks	0	1	2	3	Average
%	22	30	28	20	1.5

A suitable response could have included one of the following steps from the recipe for shortcrust pastry:

Step in making pastry	Judgment made when the step has been completed	Importance of the step in producing a high-quality pastry
Measure accurately	Used correct amount of ingredients by reading scales accurately, using measuring cups and spoons, and levelling off ingredients	Accurate measurement of ingredients will result in the correct ratio of butter to flour. The pastry will be tender and will melt in the mouth; not too dry, not too moist
Rubbing in	Mixture will resemble breadcrumbs; even tiny balls of butter, no big lumps of butter	Accurate rubbing in will result in a pastry that has a short, tender texture with no visible lumps of butter
Adding sufficient liquid	Dough comes away from side of bowl, no dry bits, not too wet	Adding sufficient liquid will ensure dough holds together and does not fall apart; too much liquid will cause dough to be tough



Step in making pastry	Judgment made when the step has been completed	Importance of the step in producing a high-quality pastry
Kneading	Smooth ball, light and soft, not tough and solid Springs back when touched lightly	Insufficient kneading will cause the pastry to crumble; over kneading will overwork the gluten leading to tough pastry
Resting	Leave in refrigerator for half hour – timer on	Resting relaxes the gluten in the pastry, which means the pastry does not shrink when cooked.
Rolling	<ul style="list-style-type: none"> <li>Evenly rolled, pastry not stretched, no holes</li> <li>Large enough to cover base and sides of pie dish without stretching</li> </ul>	<ul style="list-style-type: none"> <li>Even rolling means pastry will rise evenly</li> <li>Holes in pastry will cause the mixture to ooze through making the pastry soggy and stick to the tin</li> <li>If the pastry is stretched, the gluten will also stretch causing the pastry to shrink when baked</li> </ul>

Students were directed only to the short-crust pastry recipe, not to preparing the filling or to baking the completed pie.

The following is an example of a good student response to this question.

*Rub the butter into the flour. – When the butter has been evenly distributed throughout the flour and there are no lumps the mixture will look like breadcrumbs.*

*If the butter is not evenly distributed, then the sensory properties of the pastry will be poor eg. Pastry may have greasy spots.*

**Question 4a.**

Marks	0	1	2	Average
%	11	19	70	1.6

A suitable response included two of the following personal hygiene practices:

- wash hands before handling food, especially after using the toilet
- wear protective clothing over street clothes
- keep fingernails short and clean; do not wear nail polish when preparing food
- tie hair back and wear a hair net to prevent loose strands of hair from falling into the tomatoes.
- cover cuts and wounds with a clean, sanitised dressing.

**Question 4b.**

Marks	0	1	2	3	4	Average
%	26	18	23	17	16	1.8

A suitable response could have included two of the following in terms of the role of the authority in addressing the food poisoning incident:

**National level**

Food Standards Australia and New Zealand (FSANZ):

- develop the Food Standards Code, from which the states develop their food acts that control the manufacture of food in Australia
- coordinate recall and provide advice regarding communications and recall strategies; maintain detailed records of recalls
- coordinate recall nationally and inform state health authorities of the danger the tomatoes pose to consumers, who instruct local authorities to remove contaminated tomatoes from the shelves
- liaise with quarantine services where imported tomatoes are involved.

**State**

- The Victorian Government developed the *Food Act 1984* and the *Food (Amendment) Act 1997* to ensure a safe food supply, which outlines the legal responsibilities of all food manufacturers and retailers in Victoria.
- The State Government can issue ‘closing orders’ against a food premises if a food contamination incident occurs.
- The State monitors the efficiency and effectiveness of food recalls by actions such as providing details of recalls to relevant organisations such as councils, food business and other government and community



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agencies that may be affected; ensure recovery of affected goods and destruction of goods; liaises with FSANZ about recall action.

## Local

- Environmental health officers inspect food premises on behalf of local councils.
- Local councils will inspect the premises after notification that the problem has been rectified and an amended food safety program has been submitted.
- Local governments follow up on 'closing orders' in the case of a food contamination incident. The Council takes action to ensure the premises are cleaned according to the Food Premises Code.
- No legislative powers to order recalls, but may be delegated functions by the state health authority; for example, ensure information about the recall is available at point of sale; oversee collection and destruction of recalled food.

Food Standards Australia and New Zealand do not police food recalls, they only oversee the recall.

## Question 4c.

Marks	0	1	2	Average
%	43	31	26	<b>0.9</b>

Students did not answer this question well. A correct response could have been: A HACCP system examines every stage in the food production process and identifies potential hazards. The hazards or critical control points are noted and steps taken to address or remove the hazard so that safe food is delivered to consumers.

The following is an example of a good response to this question.

*A HACCP system prevents unsafe food by analysing a series of seven steps across the whole food production system. It determines any potential hazards as 'critical control points'. Corrective actions are then put in place to ensure the hazards are minimised or prevented.*

## Question 4d.

Marks	0	1	2	Average
%	17	35	48	<b>1.3</b>

A correct response could have included: Food poisoning is an illness that occurs from eating contaminated food. Food spoilage refers to food that can be unpleasant to eat as its physical or sensory properties may have deteriorated, but it may still be safe to eat.

## Question 4e.

Marks	0	1	2	3	4	Average
%	15	11	17	17	40	<b>2.6</b>

A suitable response to describe conditions that are required for bacteria to grow and contaminate food could include two of the following:

- moisture – bacteria need moisture to carry out their normal cell function and to be able to grow and divide
- temperature range – bacteria grow well between 5 °C and 60 °C, the 'danger zone'
- time – bacteria are the fastest growing microbes, time will allow them to reproduce rapidly and the bacteria will have doubled in number in 20 minutes
- food supply – bacteria thrive in protein or 'high risk' foods
- oxygen levels – many bacteria need oxygen to survive and reproduce
- pH – bacteria require a low acid or neutral environment to grow and reproduce.

## Question 4f.

Marks	0	1	2	Average
%	53	17	30	<b>0.8</b>

Students did not answer this question well. A correct response to list a cause of food spoilage and description of how it can cause food to spoil could have included:

- moulds – form spores on cheese, bread, pumpkin, citrus fruit
- yeasts – produce bubbles on the surface of fruit juices, vinegar, producing an 'off' flavour and odour
- enzymes – natural chemicals present in food that cause bananas, pears and stone fruit to ripen and bruise.

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The following is an example of a good response.

*Enzyme action can cause food spoilage. Enzymes are responsible for ripening and aging and if the food becomes over-ripe its appeal to the consumer is often lost and it's sensory properties deteriorate.*

### Question 4g.

Marks	0	1	2	Average
%	24	31	46	1.2

A correct response to explain how dehydration can preserve tomatoes could have been: When tomatoes are dehydrated, the water content of the tomatoes is reduced to a very low level – between 5 and 25 per cent. The low level of water prevents enzyme and microbial activity taking place within the cells of the tomato, preventing food spoilage or food poisoning bacteria from reproducing.

### Questions 5ai. and 5aii.

Marks	0	1	2	3	Average
%	27	9	29	35	1.7

#### 5ai.

A correct response could have been line extension.

#### 5aii.

A correct response for part ii could have included two of the following advantages of this type of product development:

- Nestlé know the product is successful because it is already in the marketplace, so little risk is involved
- Nestlé are able to expand their sales and increase their profit
- Nestlé already have the equipment and expertise in manufacturing established
- preserves brand loyalty
- less expense to the company in comparison with developing a 'me-too' product
- Nestlé are able to respond to consumer demand relatively quickly.

### Question 5b.

Marks	0	1	2	3	4	Average
%	19	11	25	13	32	2.3

A correct response to comparing continuous processing and the batch system could have included:

- the continuous processing system can produce large quantities of ice cream quickly and efficiently while only smaller quantities of ice cream are made by the batch system
- each container of ice cream made by the continuous processing system will be uniform in volume, flavour, colour and texture, unlike ice cream made by the batch system that could vary depending on the quality of ingredients used in each batch, the freshness of the ingredients and the skills of the chef
- the unit cost of each container of ice cream made by the continuous processing system is relatively low, while ice cream made by batch processing is often more expensive as it may be made with more expensive ingredients
- the batch production system allows for specific flavours of ice cream to be produced as required; for example green tea ice cream, unlike ice cream made by the continuous processing system, which relies on producing bulk quantities of each flavour
- ice cream made by the continuous processing system uses less labour than the batch production system, resulting in a lower unit price
- ingredients for ice cream made by the continuous processing system can be purchased in bulk and, therefore, at lower cost than batch-produced ice cream
- the initial set-up for ice cream made by the continuous processing system may be more expensive, but the unit cost of the ice cream will be relatively low. In contrast, ice cream made by the batch production system may only require basic kitchen equipment and a small ice cream machine but will be more expensive per unit cost as only small volumes of the product can be made at the one time.

Students were required to compare the two systems. Students were required to include four points of comparison in their response to be awarded full marks.

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## Question 5c.

Marks	0	1	2	3	Average
%	55	9	15	21	1

This question was very poorly answered and many students did not include an example in their answer. A correct response could have included one of the following technologies used in the manufacture of new food products:

### Membrane technology, or ultrafiltration, or reverse osmosis

- Ultrafiltration occurs when milk is pumped through a series of membranes that separates dissolved or suspended solids, such as fat, from milk.
- It can be used to make nutrient modified milks – low fat, high protein/calcium milk.
- Rev milk; Pura Boost or HiLo milk.

### Microencapsulation

- An active ingredient, such as omega 3 fatty acid, is surrounded by a thin, biodegradable shield forming a minute capsule (to protect it during processing or to mask the flavour or odour).
- Up omega 3 bread or Golden Circle Orange juice with omega-3.

### Plant breeding

- The use of technology to select chosen characteristics (genes) from a plant (from a related species) and place into another plant in a laboratory environment to create new plant varieties. This process is quicker and more accurate than traditional plant breeding.
- Kumato, delayed ripening pineapple, seedless watermelons, broccolini, baby cos lettuce, baby bok choy, purple cauliflower.

### Genetic modification

- Involves the application of genetic engineering to directly manipulate genetic information by selecting desired characteristics and transferring them by splicing them into another plant or animal to create a new species with improved characteristics.
- Flavr savr tomatoes, faster growth rates in cattle, non-browning/non-sprouting potatoes.

### Developments in plant breeding – plant sterol esters

- New developments in technology have enabled plant sterol esters to be identified and isolated, and special canola-based spreads to be produced to carry the plant sterol esters.
- Flora pro-activ or Pura Heart Active milk

### Developments in plant breeding – Hi-maize

- Scientists have identified and isolated maize with a high amylose content that would provide high levels of resistant starch. Has unique manufacturing properties – able to withstand most food processing methods, has no flavour or aroma.
- Wonder White bread/muffins

Pasteurisation, homogenisation, UHT or microwave technology are not examples of a suitable technology. Two marks were awarded for an explanation of the process of this technology; one mark for identifying a suitable food produced.

The following is an example of a good student response to this question.

*Technological development: Plant Breeding using biotechnology*

*Plant breeding using biotechnology involves taking desirable traits from a plant and transferring it into another plant of the same species so that it now has the desirable trait. It is done in a laboratory. Two breeds of maize were crossed to produce the fibre rich, flavourless, colourless, aroma less Hi-Maize and this is used in foods such as bread to increase the fibre content.*

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## Question 5d.

Marks	0	1	2	3	4	Average
%	34	16	17	9	23	1.7

A suitable response could have included two of the following functions of the packaging of ice cream:

- containment – the ice cream is packaged in various sizes that enables it to be moved or transported from the place of manufacture to the distributor or point of sale and then to the consumer to transport home
- communication – consumers can be informed of the benefits of the ice cream; for example, being low in fat, nutrient content, serving suggestions, best-before date
- convenience – the ice cream can be produced in different size packages to suit different consumer needs
- preservation – ensures the ice cream retains its fresh flavour and creamy texture
- protection – protects the ice cream from contamination and tampering during transportation.

Students were required to both identify and describe two functions to receive full marks. Students did not answer this question well.

The following is an example of a good response to this question.

*Containment- the ice cream needs to be secured for transport to reduce spillage or spoilage or other damage.*

*Communication- the information on the packaging gives the consumer information about what the product is and what it contains.*

## Question 5e.

Marks	0	1	2	Average
%	14	49	37	1.2

A suitable response could have been one of the following strategies to minimise the environmental impact of the disposal of the packaging:

- Nestlé could use recyclable paperboard rather than new paper to manufacture their cardboard packaging
- Nestlé could use recycled water in the manufacturing of the packaging if possible
- recycled water could be used in the cleaning of the production premises
- Nestlé could use green power (solar or wind power) where possible
- Nestlé could monitor emissions and service equipment regularly to ensure it is operating efficiently
- Nestlé could ensure the packaging is made of material such as paperboard or plastic that can be recycled.

## Question 6a.

Marks	0	1	2	Average
%	45	19	36	0.9

A suitable response to define functional food could have included:

A functional food is any food or ingredient that may provide a health benefit beyond the traditional nutrients that it contains.

To gain two marks, students were required to mention both the health benefit and its link to traditional nutrients. Students did not answer this question well.

The following is an example of a good student response to this question.

*Functional foods are foods that have additional health benefits to those which they traditionally contained. Eg' calcium enriched milk.*

## Question 6b.

Marks	0	1	2	Average
%	47	23	30	0.89

Students did not answer this question well. A suitable response to explain the meaning of 'health claim' could have included: A health claim describes a direct relationship between a nutrient and a disease or related condition.

To gain two marks, students were required to identify that there is a relationship between the nutrient and a disease or condition.

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The following is an example of a good response to this question.

*An expressed or implied claim on the packaging of food that describes a relationship between an ingredient or component and reduced risk of disease or illness.*

### Question 6c.

Marks	0	1	2	Average
%	35	34	31	1

A suitable response to explain why nutrition information related to nutrition is allowed on food labels and most health claims are not could have been: Nutrition information and messages on product labels are allowed to enable consumers to make an informed choice about the nutrient value of the food. However, health claims are not allowed as they can mislead consumers into thinking that consuming a particular product will be the 'magic potion' for their health concern.

### Question 6d.

Marks	0	1	Average
%	28	72	0.7

The authority responsible for labelling regulations is Food Standards Australia and New Zealand.

Students needed to write the answer in full. The acronym FSANZ on its own did not show a clear understanding.

### Questions 6ei. and 6eii.

Marks	0	1	2	3	4	Average
%	4	3	21	39	32	2.9

A suitable response could have included two of the following:

Labelling requirement	Information that must be included on the label	Benefit to consumer
Nutrition information	Nutrient amounts of the food are listed per 100 gram serving and the amount of nutrients per serve	Enables consumers to make informed choices about nutrient levels in the food
Percentage labelling	Foods included are listed individually with the % amount contained in the food related to the size of the container	Allows comparison for quality or value by the consumer
Best-before or use-by date	Indicates the date that the food is at its best until, if it has a shelf life of less than two years	So that consumers know that the quality of food is at its best until that date
Disclosure of major allergens	Must identify those ingredients likely to trigger an allergic reaction; for example, nuts, milk, egg, gluten	To inform consumers of any allergy-related risks, which will help prevent people who may be allergic to these foods from consuming them
List of ingredients	Must be listed in descending order by ingoing weight	To allow consumers to identify specific ingredients and make comparisons with similar products if desired

### Question 7a.

Marks	0	1	2	Average
%	66	17	18	0.6

This question was very poorly answered and many students did not choose from the three environmental issues provided. A suitable response could include one of the following:

#### Poor water management

- Approximately 40 per cent of water accessed for irrigation of food crops is lost through seepage and evaporation.
- Use of spray irrigation rather than drip irrigation uses greater volumes of water and cannot be as efficiently managed.
- Poor management of irrigation can lead to rising water tables and increasing salinity, making some land unsuitable for future agricultural production.



- Incorrect timing of irrigation – irrigating in the heat of the day leads to a loss of much of the water through evaporation.
- Some food production uses large volumes of irrigated water and diverts precious water away from other environmental uses such as maintaining the health of rivers.

**Misuse of pesticides and herbicides**

- Herbicides and pesticides are used to prevent pests from attacking crops or to stop weeds. They can be washed into watercourses and pollute ground water supplies and watercourses downstream.
- Herbicides and pesticides can be washed into rivers and dams causing blue-green algae, creating toxic conditions for fish and livestock.
- Aerial spraying of pesticides and herbicides may result in wind-drift of chemicals onto neighboring crops and farmhouses.

**Land degradation and deforestation**

- Land is often cleared to provide pasture for beef and sheep that are used to provide meat for consumers or for the planting of cereal or fruit and vegetable crops. These practices can lead to soil erosion or to loss of nutrients through over-cropping.
- Cleared land often has higher levels of salt, leading to a rise in the water table and an inability of crops to grow.

The following is an example of a good response.

*Poor water management. In particular the primary production of various crops can result in severe misuse of precious water resources. This can result in excess ground water which leads to salinity which causes the productivity of the land to be decreased.*

**Questions 7b and 7c.**

Marks	0	1	2	3	4	Average
%	53	13	14	8	13	1.2

**7b.**

**Poor water management**

- Upgrade irrigation systems to drip irrigation; enclose irrigation channels to prevent evaporation.
- Laser levelling during flood irrigation to ensure that water is distributed evenly and some areas do not become flooded.
- Maintain and repair damage to open irrigation systems to prevent excessive water loss.

**Use of pesticides and herbicides**

- Ensure accurate aerial spraying by low-flying over the area to be fertilised to minimise the amount of herbicides and pesticides that spread to other areas through wind-drift.
- The use of satellite tracking technology to ensure that farmers only apply the pesticides/herbicides in the required areas.
- Organic farming – organically grown foods are produced without using any herbicides, pesticides, fungicides or synthetic fertilisers during their production. This benefits the environment by reducing the run-off of chemical residue into streams or contamination of nearby land through wind-drift.

**Land degradation/deforestation**

- Minimise soil tillage to prevent the soil being exposed to wind and rain and washing away or being blown away in wind storms.
- Use direct drilling techniques to ensure plant stubble remains on the soil surface after farming to prevent soil erosion.
- Plant trees and use existing trees as windbreaks rather than clearing land, to minimise the exposure to wind erosion.
- Use contour farming practices so that crops can be grown on the natural contours of the land, which will prevent soil erosion.
- Employ a crop rotation system that includes a legume crop to add nitrogen and, therefore, improve the health of the soil.
- Not over-stocking – animal activity can compact the soil, preventing grass from growing and denuding the vegetation providing the conditions for wind and water erosion.



The student's response should have related to the previous answer and should have recited the problem selected.

The following is an example of a good response to 7b.

*Farmers should install drip-irrigation systems so that they can effectively manage their usage of water and ensure that they only use the required amount of water needed for optimum yield. This will reduce problems such as salinity.*

**7c.**

A suitable response to explain how the suggested strategy would provide an economic advantage to the primary producer could have been one of:

- **Poor water management:** Farmers who are able to reduce their water use through effective farming techniques will gain an economic advantage through reduced costs associated with purchasing water and; therefore, they should increase their profits.
- **Use of chemicals:** The use of farming techniques that will use fewer chemical herbicides will provide an economic advantage by decreasing the expenses for farmers by reducing the number of these very expensive farming products required to produce a high yielding and healthy crop.  
or  
**Organic farming:** There is growing consumer demand for organic food produced without the use of pesticides and herbicides and, consequently, this has enabled organic farmers to increase their profits and gain an economic advantage through the production of clean, green food.  
or  
Farmers who produce organic produce do not need to purchase herbicides and pesticides, therefore reducing the expenses involved in food production and ensuring increased profit and an economic advantage.
- **Land degradation/deforestation:** Effective land management can produce an economic advantage for farmers as strategies such as crop rotation will minimise soil erosion and enable farmers to build up the nutrients in the soil and produce crops with a higher yield, which will result in greater profits for the farmer.

Students' responses needed to link back to the environmental issue originally selected. They should have shown how the economic advantage was obtained by the primary producer.

The following is an example of a good response to part c.

*This strategy of drip-irrigation is an economic advantage to the producer because less water is used which involves less cost in the purchasing of the water and this will be an economic advantage to the producer through increased profit.*