

2016 VCE Food and Technology examination report

General comments

The 2016 Food and Technology examination assessed students' knowledge and understanding of Areas of Study 1, 2 and 3 of Units 3 and 4. All key knowledge and skills that underpin the outcomes were examinable.

The examination consisted of two parts: Section A contained 15 multiple-choice questions and Section B contained five questions with subparts and one extended-response question.

This report should be read in conjunction with the 2016 Food and Technology examination.

Areas of strength

Demonstrating an understanding of:

- food poisoning and food spoilage
- correct storage practices in food preparation and processing
- target markets
- new technology – ultrafiltration
- the method of modified atmosphere packaging (MAP) systems
- primary and secondary processing of food
- the function of gluten in making a dough
- functional foods
- the difference between health claims and nutrition content claims.

Areas of weakness

- not giving specific examples when required in the question
- not reading the information provided in the question and not relating the answer to that information
- not demonstrating an understanding of the role of each level of government in relation to the development of a food safety program
- not demonstrating an understanding of the difference between food intolerances and food allergies
- suitable methods for cooking tender cuts of meat
- not demonstrating an understanding of the factors used when marketing a food product – price, place, product and promotion
- not demonstrating an understanding of the functional properties of egg whites, aeration and structure
- not understanding the type of information provided by a nutrition label
- not understanding how food cooks in a microwave oven
- not understanding the responsibility of manufacturers to ethically market their food to children
- not demonstrating an understanding of the reasons for preservation, the process used to heat-process food or the changes in the sensory properties when fruits undergo this process

- not understanding the principles of the HACCP system and applying them to the manufacture of sushi
- not understanding how genetically modified vegetables can affect the environment
- not understanding the impact of food waste on the environment
- applying specific terminology to a case study – food product development, quantitative and qualitative analysis, driving forces

Specific information

Note: Student responses reproduced in this report have not been corrected for grammar, spelling or factual information.

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The statistics in this report may be subject to rounding resulting in a total more or less than 100 per cent.

Section A – Multiple-choice questions

The table below indicates the percentage of students who chose each option. The correct answer is indicated by shading.

Question	% A	% B	% C	% D	Comments
1	42	4	45	9	Tender cuts of meat have a lower ratio of connective tissue to muscle fibre and should be cooked for a short period of time. These meats have enough water present in their tissue to enable conversion of collagen to gelatin, therefore a cooking method that requires little or no liquid, such as stir-frying, is the best choice. Options A, B and D all involved additional liquid or water and longer cooking processes.
2	4	12	6	77	
3	2	2	11	85	
4	74	6	14	6	
5	7	7	67	19	
6	24	17	33	26	Option B outlines the typical design process best.
7	20	4	69	7	
8	78	4	13	4	
9	13	1	5	81	
10	20	3	12	65	

Question	% A	% B	% C	% D	Comments
11	31	26	22	21	Casein is the name of one of the proteins found in milk. Meat, wheat and seafood do contain proteins but they are not casein.
12	1	40	9	50	A food intolerance is a chemical response to particular foods; it is not an immune response.
13	11	22	40	26	State authorities have the responsibility of ensuring that the food standards developed by FSANZ are implemented in the <i>Food Act</i> (1984) and become law in the state. They develop guidelines to assist food businesses to prepare a food safety program, approve all food safety auditors and food analysts to review food safety programs, and establish procedures to audit food safety programs. Local governments are responsible, on a daily basis, for monitoring the implementation of the requirements of the <i>Food Act</i> within their local area.
14	11	79	4	6	
15	33	39	13	15	Foods that are deep fried should be as dry as possible to prevent spitting. The temperature of the oil/fat will vary depending on the food item being cooked. Smoke point is the temperature at which fats/oils begin to burn or denature and leave the food with an unpleasant flavour. The temperature of the fat/oil is lowered when food is added and if too much is added at the one time this will not allow the food to cook evenly.

Section B

Question 1a.

Marks	0	1	2	Average
%	3	47	50	1.5

A suitable response could have included two of the following:

- avoids waste from an over-supply of foods
- extends the shelf life of fruits so that they are available when the fruit is not in season
- increases the range of food choice all year round
- allows foods to be transported over long distances
- easier and more convenient meal preparation.

Question 1b.

Marks	0	1	2	3	Average
%	52	25	14	10	0.8

A suitable response could have included:

- Fruit is placed into a glass jar or bottle, and the bottle is filled with liquid such as water or sugar syrup.

- The jar or bottle is then sealed with a lid and placed into a water bath to be heated to a high temperature (75 °C to 100 °C).
- The heat kills microorganisms that cause food spoilage and so extends the shelf life of fruit.

Two marks were awarded for the description of the process, and one mark was awarded for the explanation of how the technique preserves the fruit.

This question was not well answered.

The following is an example of a high-scoring response

Bottling is a method of preserving fruit as it involves placing the fruit in a sealed jar with a liquid. The jar is then placed in a water bath and the water is heated to a high temperature (100°C) to create a vacuum seal. This kills food spoiling bacteria and prevents any more bacteria or air entering the bottle and creates a sterile environment.

Question 1c.

Marks	0	1	2	3	Average
%	35	29	23	13	1.2

A suitable response could have included the following points:

- Makes the flesh of the fruit become very soft, although they will still hold their shape.
- The flavour will intensify as the natural sugar caramelises due to the heat processing.
- There may be some colour loss and the pear flesh may become translucent or lighter in colour.
- The fruit will have a slightly sweeter aroma.

This question was not well answered.

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

The fruit would soften due to the heat. The cellulose in the cell walls begins to break down. The texture would become more tender while the flavour and aroma would strengthen. The colour of the pears would lighten.

Question 1d.

Marks	0	1	2	Average
%	37	28	35	1

A suitable response could have included the following:

Heat is transferred to the cake through convection currents. The air inside the oven is heated and the air molecules expand. The hot molecules rise, forcing the cooler molecules to move downwards in their place, which in turn are heated and also rise. This cycle continues throughout the cooking process. Some heat will also be radiated off the walls of the oven.

Question 1ei.

Marks	0	1	2	Average
%	48	22	30	0.8

A suitable response could have included:

The surface of the food does not get sufficiently hot for the Maillard reaction or caramelisation to occur, and the microwave does not produce a dry heat.

Question 1eii.

Marks	0	1	2	Average
%	13	47	40	1.3

A suitable response could have included two of the following:

- Use only microwave-safe containers such as glass, particular plastics or ceramics.
- Metal should not be used as it reflects microwaves and causes arcing that can damage the magnetron in the oven.
- If covered food is removed from the microwave oven, lift the plastic wrap away from your face to prevent a steam burn.
- Use oven gloves to remove hot items from the microwave oven.
- Do not use the microwave near water.
- Ensure hands are dry before plugging in, unplugging or operating the microwave oven.
- Do not use if the electrical cord is frayed.

Question 1fi.

Marks	0	1	2	Average
%	36	26	38	1

- Water erosion can be caused by overuse of water and can result in the loss of the topsoil and reduce the amount of nutrients in the soil that will degrade the land and affect its productivity.
- If the irrigation systems used in the orchard are poorly managed this can cause excess water to be added to the groundwater supplies. This causes the water table to rise, resulting in water and salt emerging through the topsoil. A salt crust forms on the surface of the soil, causing the land to degrade.

Question 1fii.

Marks	0	1	2	Average
%	22	40	38	1.2

A suitable response could have included two of the following:

- Use sensors to monitor the amount of water being applied.
- Use drip irrigation rather than open channels on the orchard.
- Monitor water quantity using soil moisture monitors.
- Maintain and repair drip irrigation systems and/or water channels.
- Recycle the irrigated water.
- Dam rainfall or recycled water to use when required.
- Water at night to limit evaporation.

Question 2a.

Marks	0	1	2	3	4	Average
%	30	27	26	10	7	1.4

A suitable response could have included the following:

- Aeration is caused by the beating of the egg white, which causes the protein to denature, creating a foam made from many air bubbles. When cooked, the air trapped in the foam expands and the pavlova increases in size.

- Structure – The egg white is denatured during beating and it coagulates when cooked. This contributes to the structure of the pavlova. The egg white structure does not collapse as it sets rigid and crisp.

To be awarded full marks, students needed to refer to both structure and aeration.

This question was not well answered.

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

Egg whites trap air bubbles formed during beating, causing aeration to occur. The protein strands unwind and denature, allowing the air to be trapped, increasing the volume of the mixture and giving a light airy texture.

The egg whites form the structure of the pavlova as when heated and baked the proteins coagulate and set to form a structure that holds its shape whilst being rigid and crisp.

Question 2b.

Marks	0	1	2	Average
%	35	40	25	0.9

A suitable response could have included two of the following:

- Egg whites should be used at room temperature.
- Egg whites should be slightly stale/older.
- Ensure no traces of yolk are found in the egg whites as fat in the yolk inhibits foam from forming.
- Use a clean bowl and beaters with no traces of fat on them.
- Do not use plastic as this can retain fat, inhibiting foam from developing.
- Do not under or over beat.
- Only beat when you need the whites as the foam does not hold if beaten ahead of time.

Question 2ci.

Marks	0	1	2	Average
%	33	19	48	1.2

A suitable response could have been:

These eggs are considered a functional food because they provide a health benefit beyond basic nutrition, as eggs do not naturally contain omega-3 fatty acids.

Question 2cii.

Marks	0	1	2	Average
%	17	42	41	1.3

Suitable responses could have included two of the following:

- Having omega-3 fatty acids in an everyday accessible food is helpful for consumers.
- Omega-3 fatty acids have many health benefits:
 - healthy heart, eye and brain development
 - lowering low-density lipoprotein cholesterol levels and maintaining a steady heartbeat
 - lowering triglyceride levels and reducing blood pressure, i.e. decreasing the risk factors of cardiovascular disease
 - reducing inflammation and supporting the immune system

- may play a role in the prevention and treatment of depression.
- People are more health conscious so the manufacturer can capitalise on this growing market and increase their market share.
- It is relatively easy to produce omega-3 eggs – producers just need to provide chickens with food containing omega-3.
- Producers can expand their product range and increase their profitability.

Question 2d.

Marks	0	1	2	Average
%	41	31	28	0.9

A suitable response could have included the following:

- The eggs are produced without the use of artificial pesticides and herbicides that may have a detrimental effect on the environment.
- The use of both organic and sustainable methods of pest and disease control may ensure that the health of the plants and chickens is maintained.
- Organic food production cannot use genetically modified organisms that can transfer into the environment.
- Chickens are fed grain that is chemical-free, and therefore there will be no chemical runoff into waterways.
- Organic food production avoids the use of substances such as livestock feed additives and growth hormones that may harm the environment.

Question 3a.

Marks	0	1	2	3	Average
%	26	19	24	31	1.6

A suitable response could have been:

A 'source of fibre' is considered to be a nutrition content claim as it is a statement about the amount of a nutrient in the breakfast cereal. This statement is not a health claim as no relationship between the consumption of the nutrient in the breakfast cereal and a health benefit it can provide has been made; for example, 'fibre is important for digestive health' would be considered a health claim.

Question 3bi.

Marks	0	1	Average
%	30	70	0.7

The correct response was Food Standards Australia New Zealand.

Question 3bii.

Marks	0	1	2	Average
%	33	39	27	1

A suitable response could have been:

A nutrition label provides information on the amount of energy and nutrients such as protein, fats, carbohydrates, sodium and other nutrients such as calcium, fibre and iron provided by the food product. This information is presented as per serve and per 100 g/100 mL.

Question 3c.

Marks	0	1	2	3	4	Average
%	7	14	29	24	26	2.5

Suitable responses could have included two of the following:

- Product: the product might highlight the fibre content and health benefits of the breakfast cereal so that it is appealing to families.
- Price: the breakfast cereal might be priced so that it is competitive with similar competitors' products and be affordable to young families.
- Promotion: the new breakfast cereal might be advertised during children's television viewing hours or at children's sporting events. The advertising material might also highlight its health benefits of being a high-fibre breakfast food for children.
- Place: the new breakfast cereal might be available in locations where families with children shop, such as supermarkets (including online) or convenience stores.

Question 3d.

Marks	0	1	2	Average
%	44	30	26	0.8

Suitable responses could have included:

Manufacturers should ensure that the marketing strategies used for the breakfast cereals are fair, accurate and not misleading. Children are not able to make informed consumer decisions as they do not understand the intentions of advertising; for example, advertisements can be seen as entertainment and children cannot distinguish between information and the intent to persuade, and may be easily misled into purchasing foods high in salt, fat or sugar.

This question was not well answered.

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

Children are extremely vulnerable as they lack the knowledge and maturity to both identify foods that are unhealthy and high in fat, salt or sugar and recognise manipulative advertising. They may not be aware the advertising is misleading or the impact these foods could have on their long-term health e.g. become obese.

Question 4a.

Marks	0	1	2	Average
%	44	18	38	1

- Cooked rice is warm and will contain moisture, which are conditions for bacteria to multiply and grow and may cause food poisoning.
- Cooked rice may contain the spores from bacillus cereus that are not destroyed by cooking and may cause food poisoning if stored incorrectly; for example, left to cool on a bench.

Question 4b.

Marks	0	1	2	Average
%	14	35	51	1.4

A suitable response could have been:

Products containing cooked rice should be stored in a covered container, out of the danger zone – that is, below 5 °C or above 60 °C.

Question 4c.

Marks	0	1	2	3	Average
%	66	3	11	20	0.9

A suitable response could have included:

Gelatinisation – starch granules in the rice absorb liquid in the presence of heat, and swell and soften.

One mark was awarded for the name of the process (gelatinisation) and two marks were awarded for the description of the process that referred to both the physical and sensory properties of rice.

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

Gelatinisation: the starch within the rice absorbs the water when heated and eventually burst creating a gel-like consistency. This changes the rice from being initially hard and translucent to soft and white in colour and tender.

Question 4d.

Marks	0	1	2	Average
%	9	25	65	1.6

A suitable response could have included two of the following:

- Ensure flywire screens are fitted to all windows. Seal all gaps around fittings in walls and floors so mice and rats cannot access the kitchen.
- Ensure there is no water or food available for pests – clean the floors and wall surfaces thoroughly and empty rubbish bins so there are no spills or food waste for rodents to eat.
- Use baits or traps to capture/kill rodents or call a pest controller if they enter the premises.

Question 4e.

Marks	0	1	2	3	4	Average
%	37	22	19	12	10	1.4

A suitable response could have included the following:

- Establish critical limits: involves setting or establishing limits and includes time, temperature and pH specifications; for example, set the cooking temperature for individual food items or the temperature to which the food should be chilled to ensure bacteria are unable to multiply.
- Establish a record-keeping system for the HACCP system: the company must establish a set of records of the results of monitoring their critical control points (for example, refrigerator temperatures). These records are used for auditing purposes and to enable the company to check for improvements.

This question was not well answered.

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

Establish critical limits: This step involves setting limits with temperature or time that are involved in the production of the sushi e.g. the temperature the sushi will be stored at. These temperatures or times will ensure that safe food is produced and stored if they are used.

Establish a record system for the HACCP program: the sushi company must set up a set of records of the results of monitoring their critical control points. These allow the company to check for improvements and must be kept for auditing.

Question 4fi.

Marks	0	1	2	Average
%	14	41	45	1.3

Question 4fii.

Marks	0	1	2	Average
%	21	54	26	1.1

A suitable response could have been:

Step in sushi production	Potential hazard	Corrective action
delivery of the uncooked rice	Rice packaging may be damaged.	Return any rice with damaged packaging to the supplier.
	Rice may be infested with weevils.	Return contaminated rice to the supplier.
	Rice may be past its best-before date.	Return any rice past its best-before date to the supplier.
preparation of the uncooked chicken and salmon	Raw chicken and raw salmon may cause cross-contamination.	<ul style="list-style-type: none"> wash hands thoroughly before preparing the raw chicken or salmon store cooked food above raw food in the refrigerator wash all equipment such as boards and knives thoroughly after preparing the raw chicken or fish to prevent the food poisoning bacteria from transferring to other foods

Question 4g.

Marks	0	1	2	Average
%	23	44	33	1.1

- Inspect the food premises to ensure it has been cleaned up, complies with all health and safety regulations and that the cause of the closure has been addressed.
- Review the company's food safety program to ensure it has been amended and is compliant.
- Ensure the company has appointed a qualified food safety officer.

- The environmental health officer will recommend that the company be reissued with a Certificate of Registration.

Question 5ai.

Marks	0	1	2	Average
%	22	32	45	1.3

A suitable response could have included two of the following:

- can be developed so that they are resistant to pests and diseases, requiring reduced use of chemicals – this may be a financial benefit to farmers as production costs may be reduced and they may increase their profit
- produce a higher yield than traditional potatoes, providing a greater profit to farmers
- prevents browning (potatoes) when processed
- ripen more slowly and have a longer shelf life
- frost resistant
- retain crispness
- more flavoursome

Golden rice was not an acceptable answer as the question identified vegetables and golden rice is a cereal.

Question 5aii.

Marks	0	1	2	Average
%	55	20	24	0.7

Responses could have included explanations of positive or negative effects on the environment. A suitable response could have included one of the following:

- Tougher weeds or ‘super weeds’ may develop if genes linked to herbicide resistance transfer from genetically modified (GM) plants to weeds.
- The development of ‘super weeds’ may lead to the increased use of herbicides, which could lead to contamination of waterways and groundwater supplies.
- The spread of GM crops could result if GM crops accidentally cross-pollinate non-GM, including organic, crops.
- Growing GM crops on a large scale may adversely impact biodiversity. For example, some environmentalists are concerned that the viability of some bird populations may be threatened.
- GM crops may be toxic to beneficial insects, particularly honey bees, impacting on the number of bees available to pollinate crops.
- GM crops can impact on soil ecosystems as toxins can leach into the soil and into the roots of nearby plants.
- Genetic modification of vegetables can reduce biodiversity – genetic diversity, species diversity and ecosystem diversity.
- Greater productivity due to GM may mean less usage of other natural resources.
- More resilient/drought-tolerant varieties due to GM means less use of water.
- Less use of pesticides and herbicides due to GM may mean less chemicals used and advantages to the environment.

Question 5bi.

Marks	0	1	2	Average
%	10	24	65	1.6

Question 5bii.

Marks	0	1	2	Average
%	13	28	59	1.5

A suitable response could have included two of the following steps in primary processing and related explanation:

Step in primary processing of potatoes	Purpose of the step
graded	Potatoes are graded for size, quality and maturity.
brushed/washed	Some potatoes are brushed or washed in preparation for sale to consumers or for convenience of secondary processing.
packaged	Packaged into cardboard cartons or reusable crates or into bags for sale in vegetable markets or supermarkets.
cool, dry storage	Kept in cool, dry storage to prevent sprouting, spoilage and prolong shelf life.
transport/distribution	Potatoes are transported to markets and supermarket for sale to consumers or to food manufacturers for secondary processing.

Question 5c.

Marks	0	1	2	3	Average
%	37	10	20	34	1.5

A suitable response could have been:

Enzymes – the enzyme in cut potatoes reacts with oxygen in the air, causing the surface to turn brown. This process is called enzymatic browning.

One mark was awarded for the name of the natural food component (enzyme) and two marks for the explanation of why this reaction occurs.

Question 5di.

Marks	0	1	2	Average
%	41	27	31	0.9

- Potato peelings can end up in landfill where they can create methane, a greenhouse gas.
- Methane is released into the atmosphere, giving off a very unpleasant smell or it can leach into groundwater supplies, causing contamination.

- Transportation of food waste to landfill sites uses diesel fuel and therefore adds to greenhouse gas emissions.

Question 5dii.

Marks	0	1	2	Average
%	46	22	32	0.9

A suitable answer could have included one of the following:

- Using solid food waste to produce biogas – a renewable energy supply.
- Reusing solid food waste – diverting it for use as stock food; for example, as food for pigs or cattle.
- Some could be sent to commercial composting stations and reused as fertiliser.
- Use food waste to produce another food product such as a paste or jam.

Question 6

Marks	0	1	2	3	4	5	6	7	8	9	Average
%	23	14	11	12	9	9	7	7	5	3	3.1

With reference to the scenario given, students were required to write a detailed response that included the following:

- a description of the two types of food product development
- an explanation of the advantages of each type of food product development
- a description of both quantitative and qualitative analysis, and an explanation of how each is used in food product development
- a discussion of the main driving forces that could have led to the development of this new range of pre-prepared, snap-frozen meals.

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

A 'line extension' is when a company expands their existing line of products by creating new variations. These could be with new flavours e.g. kale, chicken and quinoa lasagne or size. A 'me-too' product is a copy of an existing product that has been produced by another competing manufacturer, that another company decides they want to produce so they can get a share of the existing market. This is evidenced in the other company listed above who created a 'me-too' line of snap frozen meals by copying the successful manufacturer.

An advantage of creating a 'line extension for the original range of snap-frozen meals is that they already have the equipment, staff expertise and training if needed available to make the new product. This reduces costs and they can expand their target market without much risk as the product is already established as successful. They have also developed brand loyalty from their original frozen meal variety and are more likely to have consumers try the new product variations of the same brand as they trust the manufacturer.

A 'me-too' product is when a food company introduces a new product that is similar to one being produced by another company. This is an advantage as the product is already a success and in demand by consumers. This minimises the risk factor of the product not being successful in the market place. Less critical research needs to be done, as it already has been done by the competitor and it allows food businesses to expand their range and target market with minimal costs and hence they will make a profit.

Quantitative food analysis is a measure using scientific methods, of the foods physical and chemical properties, including size, weight, height, colour and nutrient content. This testing helps to establish the optimal physical qualities of the food, which can be used as a benchmark

for product development. It allows manufacturers to see if their product meet the required nutritional requirements and if the product will have a good shelf life.

Qualitative analysis is an analysis of the sensory or organoleptic properties of a food item. These include appearance, aroma, taste and texture of the food product. It is used to rate or rank the sensory properties of the product to determine whether it will appeal to customers or not. There are many ways to carry out this analysis, including using a panel of expert tasters to rate the sensory properties or a preference test using a nine-point scale or hedonic descriptors. This will allow the manufacturer to guage if the product will appeal to the customer and make a profit.

The main driving forces are social and technological. Advances in technology have enabled the food industry to develop products that retain the nutritional qualities of their products, can be stored for an extended period of time and are convenient for customers. Young people and busy individuals and families want reasonably healthy and easy to prepare and cook meals that they can eat that do not take a long period to prepare. The ageing population as well are looking for convenient meals in individual or servings for two that are convenient to prepare and many people have a greater knowledge of the association of diet and health.