



**2013 Food and Technology GA 3: Written examination**

**GENERAL COMMENTS**

The 2013 Food and Technology examination assessed students' knowledge and understanding of all Areas of Study in Units 3 and 4. All key knowledge and key 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 short-answer questions with sub-parts and one extended-response question.

This report should be read in conjunction with the 2013 Food and Technology examination paper.

**Areas of strength**

Demonstrating an understanding of

- food poisoning and food spoilage
- the role of AQIS
- health and safety practices in food storage and preparation
- correct hygiene practices in food preparation and processing
- the process of genetic modification and its advantages
- the actions involved in 'product recall'
- packaging systems – modified atmosphere packaging
- the primary production of milk.

**Areas of weakness**

- not giving specific examples for questions when required
- not relating the answer to the information provided in the question
- not understanding innovative technologies used in food manufacture
- not understanding the role of each level of government in ensuring safe food for consumers
- not recognising functional foods
- not understanding land degradation and what causes degradation
- not understanding or describing environmental issues in food production and their impact on the environment
- not explaining functional roles of the natural components found in foods such as oils, fats and cereals in food preparation and processing
- not explaining the impact of the judgments made during complex processes on the sensory properties of a finished product
- not understanding the quantitative analysis of foods
- not understanding terms used in the study design; for example, 'strategies', 'sensory properties', 'product development' and 'individual production plans'



## 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 errors resulting in a total 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	2	16	78	5	
2	82	7	8	4	
3	1	3	2	95	
4	55	28	4	13	Individual production plans are written to provide the chef with important information in order to produce a food item. Research would have been carried out before the food item was selected, and sensory and functional properties of the food item would have been developed during production. Health and safety procedures are carried out during the production of the food item.
5	2	89	6	2	
6	96	1	1	2	
7	11	21	62	6	
8	4	80	8	8	
9	10	10	78	2	
10	35	42	5	18	The local authority has a monitoring role. The state authority develops guidelines for the preparation of food safety programs. The national authority develops and reviews the Food Standards Code, which provides manufacturers with information on food safety programs based on the HACCP system.
11	5	9	47	39	The structure of a cereal grain is the bran layer made up of fibre, the endosperm containing starch and protein, and the germ containing protein, fats and vitamins (option D). In the other options some of the nutrient content of each section of the cereal grain was incorrect.
12	2	1	80	16	
13	13	24	5	59	Functional foods have been designed to improve health by adding to or reducing their traditional constituents. The incorrect options all contained a food item that had not been changed.
14	10	1	87	2	
15	81	10	8	2	

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## Section B

### Question 1a.

Marks	0	1	2	Average
%	14	36	49	<b>1.4</b>

Two of

- milking of cows
- collection of milk
- analysis of microorganisms and butter fat content
- pasteurisation
- homogenisation
- membrane technology; ultrafiltration or reverse osmosis
- packaging
- transportation.

### Question 1b.

Marks	0	1	2	3	Average
%	43	12	22	23	<b>1.3</b>

One of

- membrane technology involves using a porous membrane or filter to separate particles in a fluid. Ultrafiltration and reverse osmosis are two of the most widely used forms of membrane technology. Filtration membranes made from a thin polymer material separate the natural components of milk, such as particles of fat or protein, without changing them chemically
- ultrafiltration is a form of membrane technology that is used to produce reduced-fat milk. The milk is passed over membranes with minute pores that can separate larger molecules such as fat from the water, protein and lactose in the milk. This enables only a small portion of the collected fat molecules to be returned to the milk, therefore reducing the amount of fat it contains
- reverse osmosis uses a process similar to ultrafiltration, but with a finer filter that removes most of the larger particles in the milk such as fat and protein and only allows water to pass through, leaving a milk concentrate behind.

Students were required to identify an innovative technology that is used to produce reduced-fat milk, and to describe how the technology works and the properties of the milk that are removed/added.

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

*Ultrafiltration is used to produce reduced-fat milks, involves using a membrane to separate the large particles such as fat from the water, protein and lactose in milk. The larger fat molecules are collected and the water and smaller molecules pass through the membrane therefore reducing the amount of fat found in the resulting milk.*

### Question 1c.

Marks	0	1	2	Average
%	59	15	26	<b>0.7</b>

A suitable response could have included one of the following causes of food poisoning.

- Biological contamination or toxic food poisoning: food poisoning occurs when food that contains a naturally occurring substance that is poisonous to humans is eaten; for example, some mushroom species or green potatoes, which contain solanine, or rhubarb leaves, which contain oxalic acid.
- Chemical contamination: food poisoning can occur through the misuse of herbicides and insecticides, where food is contaminated by these chemicals and is ingested; for example, mercury compounds that can contaminate fish.

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

*Another cause of food poisoning is chemical contamination, which involves the misuse of agricultural compounds such as herbicides and pesticides, for example residue from a herbicide used during the growing of the food may still be present on a fruit or vegetable and lead to food poisoning.*

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## Question 1d.

Marks	0	1	2	Average
%	33	41	26	1

A suitable response could have been: The local authority receives the information from the state authorities that particular cheeses may be contaminated and must enforce the recall at a local level. Environmental health officers are employed by the local authority and will ensure that all the nominated cheese products are removed from shelves and that the cheese products are disposed of and destroyed.

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

*Local authorities, after they receive directions from the state authorities are responsible for ensuring all recalled food is collected from supermarket shelves and disposed of correctly and safely.*

## Question 1e.

Marks	0	1	2	Average
%	32	29	39	1.1

A suitable response could have been: Modified atmosphere packaging is a packaging system that modifies or changes the air composition inside the package in order to extend the shelf life of the food.

## Question 1f.

Marks	0	1	2	3	Average
%	39	13	26	21	1.3

Students were required to identify and describe one of the following modified atmosphere packaging systems.

- Barrier-specific packaging: the barrier properties of the packaging material may admit some gases at different rates and prevent others from entering the package. As fresh food respire, the barrier-specific packaging material is designed to prevent water droplets from forming on the packaging by having a covering film with anti-fogging properties. Each food product has its own barrier-specific material designed in order to keep that food product fresher for longer.
- Vacuum packaging: involves removing the air from the packaging to create a vacuum, so that oxidation does not occur. The plastic fits tightly around the food before the product is sealed.
- Gas packaging: gas mixtures are tailored to the requirements of each food and replace the oxygen in the headspace of the packaging before it is sealed. The permeability of the packaging material to oxygen, carbon dioxide and water is important for maintaining the correct gas balance.
- Active packaging: a small sachet of reactive material is included within the package. This sachet controls the moisture levels within the package, so the food stays crisp.

## Question 2a.

Marks	0	1	2	Average
%	12	45	43	1.3

A suitable response could have been: The design brief is an essential component of the design process as it includes the aims and intentions of the project and essential information about the specifications or considerations and constraints.

## Question 2b.

Marks	0	1	2	Average
%	33	35	32	1

Suitable responses could have included two of the following.

Dumplings Inc.

- may undertake direct research, such as attending international trade shows or examining new ideas in trade journals
- could examine competitors' products or new trends in dumplings
- might survey consumers to seek feedback about their needs; for example, a low-fat dumpling
- could use creative methods such as brainstorming ideas with members of the product development team
- could use a questionnaire with a focus group to determine their needs.

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## Question 2c.

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>Average</b>
<b>%</b>	18	82	

Lactose intolerance or gluten intolerance/coeliac disease

Gluten-free or wheat intolerance were not correct responses.

## Question 2di–ii.

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>Average</b>
<b>%</b>	12	26	61	

Gluten intolerance/coeliac disease

### 2di.

Wheat flour

### 2dii.

Replace the wheat flour in the pastry with gluten-free flour or rice, corn or potato flour OR replace the oyster sauce with a gluten-free variety.

### OR

Lactose intolerance

### 2di.

Dried milk powder

### 2dii.

Replace the dried milk powder with a lactose-free milk powder from plant sources such as soy.

Students were required to explain how the recipe could be altered by changing an ingredient, not just removing the ingredient from the recipe. Gluten-free wheat flour was not accepted. The answer needed to relate to the food intolerance given for part c.

## Question 2e.

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>Average</b>
<b>%</b>	20	49	23	8	

A suitable response could have been: Percentage labelling identifies the percentage of the characterising ingredient named or pictured on the label. It helps consumers to make informed choices by allowing them to understand more about what they are eating. It also helps consumers compare similar products for quality and value for money.

This question was poorly answered by many students.

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

*Percentage labelling is required by FSANZ for the ingredients that are in the name of the product or advertised on the packaging, this is so that a consumer can be aware of how much of the ingredient is really in the product and make a choice based on quality and value for money.*

## Question 2fi–ii.

<b>Marks</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>Average</b>
<b>%</b>	19	16	30	36	

### 2fi.

Australian Quarantine and Inspection Service

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2fii.

The Australian Quarantine and Inspection Service (one of)

- ensures that all food imported into Australia complies with the requirements of the Australian Food Standards Code and monitors all borders
- regulates and monitors the importation of raw and processed food products into Australia and New Zealand and makes sure that it complies with the Australian Food Standards Code
- monitors food, plant and animal products coming into Australia at international airports and seaports to prevent them from bringing in diseases that may contaminate the local food supply.

### Question 2g.

Marks	0	1	2	Average
%	73	15	12	<b>0.4</b>

A suitable response could have included one of the following responsibilities of the Victorian Department of Human Services.

- Develop guidelines for the preparation of a food safety program, which food companies can then use to register and operate their business.
- Establish the qualifications for food safety supervisors who will be employed by the business to oversee food safety during production.
- Establish guidelines to follow and required qualifications for food safety auditors when auditing and reviewing a business's food safety program.
- Provide guidelines about the cleaning of equipment and personal hygiene for food-handling courses.

This question was very poorly answered.

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

*The DHS-Department of Human Services is responsible for the implementation of a food safety program. They provide manufacturers/businesses with templates for a food safety program to ensure food safety is of a high standard.*

### Question 3a.

Marks	0	1	2	3	Average
%	10	41	36	14	<b>1.5</b>

A suitable response could have been: Many people are concerned about the use of unethical marketing to children as many of the strategies employed by food manufacturers, including the use of cartoon characters and giveaway toys, are often very persuasive. Children relate to their favourite cartoon character and will use 'pester power' to persuade their parents to purchase the food item that carries the image of their favourite character. Equally they will pester their parents to purchase a 'set' of giveaway toys. Many of the food products promoted using cartoon characters and giveaway toys are advertised during peak viewing time (for example, between 6.00 pm and 9.00 pm) for school-aged children. This is the time when most children watch television and see these advertisements. The food products being promoted to children are often high in fat, salt or sugar, and are commonly described as being energy dense and low in nutrients. Implementing such strategies is considered unethical as children do not have the critical literacy skills to be able to recognise the persuasive content of the advertising and this adds to the growing concern of increasing weight in children.

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

*The use of cartoon characters and giveaway toys can be a concern to the community as children are unable to make informed decisions about the food they want to eat. Children are drawn to the toys and cartoons without being able to understand that the food could be energy-dense and unhealthy for them as the foods are often high in fat, salt or sugar. They can pester their parents to buy the food and not understand when they say no.*

### Question 3b.

Marks	0	1	2	Average
%	10	25	65	<b>1.6</b>

A suitable response could have included two of the following promotional strategies.

- advertising in the media – television, radio, newspapers, magazines, billboards, websites
- personalised advertising through SMS or telemarketing
- point-of-sale displays in supermarkets or other retailers

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- free sample packs given out to householders or customers
- cash-back offers on products
- sponsorship of sporting events or teams
- tie-in promotions that combine related products; for example, breakfast cereal and milk or yoghurt
- shape of packaging to make it appealing to customers

## Question 3ci–ii.

Marks	0	1	2	3	4	Average
%	26	24	22	18	11	1.7

### 3ci.

A suitable response could have been: Food is packaged in its final container – a flexible plastic bottle or pouch. The product is then placed into a high-pressure chamber that is filled with water to surround the product. The pressure of the water in the chamber is increased and applied uniformly to the product for approximately 2–5 minutes (depending on the product). The pressure from the water in the chamber is transmitted to the food inside the package.

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

*It is a preservation method which involves sealing food in a plastic pouch into a water chamber. It is then subjected to intense pressure, which is evenly applied and kills microbes such as yeasts, moulds and bacteria.*

### 3cii.

A suitable response could have included two of the following benefits of using high-pressure processing technology.

- Destroys microorganisms such as bacteria, moulds and yeasts, thus ensuring the product is safe to eat and extending the shelf life.
- Nutrients and sensory properties are not affected as the product is not exposed to high heat.
- The shape and texture of food are not affected as the pressure is applied evenly in all directions.
- Artificial preservatives are not required.
- The manufacturer is able to achieve higher sales as the food has good sensory properties that appeal to consumers.

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

*It maintains the freshness, nutrients and quality of the food whilst extending the shelf life. It will allow the mango pieces to remain fresh and taste 'freshly peeled' ensuring good sales which will create profit for the manufacturer.*

## Question 3di–ii.

Marks	0	1	2	3	4	Average
%	19	20	20	20	21	2.1

### 3di.

Food Standards Australia New Zealand

### 3dii.

A suitable response could have included the following.

- Nutrition content claims are claims about the content of certain nutrients or substances in a food, such as 'low in fat' or 'good source of calcium'. For example, with a 'good source of calcium' claim, the food will need to contain more than the amount of calcium specified in the Standard. In comparison, a health claim describes a relationship between the consumption of a food, or component in the food, and a health benefit it can provide; for example, this product is high in calcium, which is good for strong bones and teeth.

Students were required to clearly describe both types of claims and include an example in their response.

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## Question 3ei–ii.

Marks	0	1	2	3	Average
%	40	26	19	14	1.1

### 3ei.

A suitable response could have included one of the following environmental concerns.

- Fruit peelings and seeds can end up in landfill, where they can create methane, a greenhouse gas.
- Methane from the fruit peelings and seeds 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, which comes from non-renewable resources and also adds to greenhouse gas emissions.

### 3eii.

A suitable response could have been one of the following strategies.

- On-sell the mango peelings to be used as cattle feed.
- Use the solid waste to produce biogas that could then be used as an energy source in their factory.
- The peelings could be used as a natural fertiliser in organic farming.
- Use the fruit waste to produce a range of new food products, such as a mango fruit paste.

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

*Turning their food waste into Biogas which is a gas produced from the bi-product of the breaking down of organic matter.*

## Question 3fi–ii.

Marks	0	1	2	3	4	Average
%	12	16	27	23	23	2.3

Any two of the following steps were required.

Step	How to judge when successfully completed	Impact on sensory properties of ice-cream when successfully completed
1	Small bubbles will appear around the edge of the saucepan; sugar will be dissolved.	When the sugar is completely dissolved in the warm milk, the ice-cream will have a smooth texture.
2	The mixture will turn a pale yellow colour and there will be no flecks of egg evident in the milk mixture. The mixture will be smooth and lump-free.	Whisking the hot milk into the egg mixture gradually will ensure that the egg yolks will not overheat, the texture of the ice-cream will be smooth and the ice-cream will have an even colour.
3	Cook the custard until it coats the back of the wooden spoon and leaves a clear path when a finger is run down the back of the spoon.	Constantly stirring the egg-and-milk mixture over a low heat will ensure that it heats evenly and produces a smooth, glossy, lump-free custard and there will be no raw egg taste.
4	The temperature of the custard will reduce to lukewarm and there will be chalaza from the egg present in the strainer. OR Once churned, the ice-cream will have changed from a liquid consistency to a smooth and thick consistency.	There will be no evidence of any chalaza from the egg throughout the custard or any skin on the surface of the cooled custard. OR Once churned, the ice-cream will have a smooth mouth feel with no ice crystals evident and an even consistency.



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## Question 4ai–iii.

Marks	0	1	2	3	4	5	Average
%	23	11	14	17	19	17	2.5

### 4ai.

Dehydration, bottling or use of sugars and vinegar

### 4aii. and 4aiii.

A suitable response could have included the following.

Preservation technique	Explanation	Impact on sensory properties
dehydration	Moisture is removed using sun or warm air where the water content is reduced to 5–20% so that microorganisms cannot survive.	Tomatoes will shrink, appear shrivelled and have a chewy texture. The flavour intensifies and the colour deepens.
addition of vinegar and sugar (for example, chutney)	Natural liquids in the tomatoes are replaced with a high-acid and high-sugar environment, which inhibits the growth of microorganisms.	Tomatoes become tender and break down into a pulpy consistency. The flavour and colour intensify.
bottling	Foods are packed into a glass jar or bottle, sealed and heated in a water bath or microwave oven. The heat kills microorganisms and a vacuum seal is created, so that the food is stored in a sterile environment.	Tomatoes can be bottled raw (whole or in large pieces), in purees or as a sauce. Raw tomatoes will retain their shape but become tender and have a milder flavour.

The responses given by students needed to be suitable for tomatoes. Many selected unsuitable preservation techniques.

## Question 4b.

Marks	0	1	2	Average
%	8	23	69	1.6

A suitable response could have included two of the following rules for using a food processor safely.

- Ensure that the food processor has been assembled correctly.
- Do not use the food processor near water or expose the electrical plug to water.
- Use the food tube to add ingredients to ensure fingers stay well away from the blade.
- Wash the blades separately and with the sharp edges away from you.
- Make sure hands are dry before operating the food processor.
- Switch off the processor and unplug it before removing attachments.
- Check electrical cords and connections regularly to make sure they are not loose or unsafe.

## Question 4c.

Marks	0	1	Average
%	40	60	0.6

Quantitative analysis

## Question 4di–ii.

Marks	0	1	2	Average
%	47	32	21	0.8

### 4di.

Profiling test or qualitative/sensory analysis test

### 4dii.

A suitable response could have included the following.

- Qualitative test: analyses the sensory properties of a food product and therefore will rate or provide information on the appearance, aroma, flavour and texture of the food, generally through a taste test.

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- Profiling test: gives a more detailed description of the sensory properties of the product to identify aspects for modification or improvement.

## Question 4ei–ii.

Marks	0	1	2	3	Average
%	20	10	28	42	<b>1.9</b>

### 4ei.

Line extension

### 4eii.

A suitable response could have included two of the following benefits to the consumer.

- nutritional content can be modified to suit particular dietary requirements; for example, salt-reduced or high in fibre
- increased variety of flavours for consumers to purchase
- allows consumers to retain their brand loyalty

## Question 5a.

Marks	0	1	2	Average
%	19	50	31	<b>1.1</b>

Organic food production involves farming practices that produce food using natural systems without the use of artificial chemicals. It is a sustainable form of food production that does not use synthetic pesticides and fertilisers but instead uses natural fertilisers such as animal manure.

## Question 5b.

Marks	0	1	2	Average
%	38	31	31	<b>1</b>

A suitable response could have included one of the following benefits to the environment.

- Farmers use organic systems to reduce insect infestation and for weed control, therefore avoiding the use of artificial pesticides and herbicides that can impact on native birds and insects.
- Sustainable farming practices such as the use of organic fertilisers – for example, animal manure – are used to improve soil health rather than relying on artificial fertilisers, which can run off the land and contaminate rivers and streams – for example, blue-green algae.
- Organic farmers are required to retain some native vegetation, therefore ensuring that biodiversity is maintained within the environment.
- Soil health is improved through strategies such as the implementation of a crop-rotation system, therefore minimising soil erosion and salination.

## Question 5ci–ii.

Marks	0	1	2	3	Average
%	45	21	20	14	<b>1</b>

### 5ci.

The scientists would have used the process of genetic modification. This involves altering the genetic material of the cereal plant by duplicating, removing or inserting one or more new genes into the organism to improve its characteristics.

### 5cii.

Students needed to choose one of the cereals listed in Question 5ci.

Canola

- improving its resistance to pesticides and herbicides – therefore, it will only require one spraying of herbicides
- has superior weed control as it grows more vigorously and can out-compete weeds
- can be dry sown
- improved yield, particularly in drought years

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## Rice

- golden rice: addition of beta-carotene to rice. The body is able to convert beta-carotene into vitamin A
- rice with a high protein content: increased protein content using genes from pea plants

## Corn

- Bt corn is herbicide- and pesticide-resistant
- genetically modified to express the bacterial Bt toxin, which is poisonous to insect pests

### Question 5di-ii.

Marks	0	1	2	3	4	Average
%	36	19	20	15	10	1.5

### 5di.

A suitable response could have included one of the following ways land can be degraded.

- Erosion can occur through severe weather conditions such as drought or through land clearing, which leaves topsoil exposed and subject to erosion by wind and water.
- Soil acidification can occur through the increased use of fertilisers and water, turning soils acidic and reducing the productivity of the soil.
- Depletion of nutrient levels through intensive cropping can lead to poor soil health.

### 5dii.

A suitable response could have included two of the following. The response needed to relate to the type of land degradation described in Question 5di.

#### Erosion

- Reduce the exposure of the soil to wind and water erosion by limiting the tillage of the soil.
- Leave stubble in the soil after harvest to hold the soil in place and reduce wind erosion.
- Plant trees and vegetation to stabilise the soil and act as windbreaks to reduce wind and water erosion.
- Minimise water erosion by building contour banks across the slope of the land to reduce the speed of water running downhill.
- Introduce contour farming and plant crops across the contours of the land to minimise the loss of soil through water erosion.

#### Soil acidification

- Introduce crop rotation that includes a legume crop to fix nitrogen in the soil, improving soil health and reducing the need to use chemical fertilisers.
- Regularly check the pH level of the soil to ensure acid levels are not high.
- Treat acidic paddocks with lime to help lower the levels of acid in the soil.

#### Depletion of nutrient levels

- Introduce crop rotation that includes a legume crop to fix nitrogen in the soil, improving soil health and reducing the need to use chemical fertilisers.
- Introduce direct drilling and no-till farming, which helps to mulch the soil and retain moisture.

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

*Land can be degraded through soil erosion. The top soil can be blown away and this will reduce the productivity of the land. Farmers could leave behind the stubble from crops to cover the soil after the crop has been harvested. This will lessen the impact of wind on the top soil and they could also use contour farming to lessen the loss of soil from water running away.*

### Question 5ei-ii.

Marks	0	1	2	3	4	Average
%	38	30	19	9	4	1.1

### 5ei.

A suitable response could have included two of the following physical properties of oils.

- liquid at room temperature

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- pale yellow/green colour
- translucent
- viscous (thicker than water)

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

*Oils are liquid at room temperature and can be a pale gold colour.*

## 5eii.

A suitable response could have included one of the following functional properties of fats and oils.

- Aeration/creaming: when butter and sugar are creamed together they form a light, fluffy mixture that can trap air cells, resulting in a light, airy texture in baked products.
- Shortening effect: fat provides cakes and biscuits with a tender texture as the fat coats the starch grains in the flour and separates the gluten strands, preventing strong cohesion. In biscuits this gives a 'short' texture.
- Heat transfer/frying: fats and oils can be heated to high temperatures, so are good conductors of heat and cook food quickly.
- Emulsification: fats can be used in the preparation of an emulsion such as mayonnaise in which the fat stays in suspension rather than separating as it would in an oil-and-vinegar dressing.
- Improved keeping qualities: when used as an ingredient in cakes and biscuits, fats such as butter or margarine can help to keep them fresher and delay the process of staling.
- Sealing and protecting: butter and oil can be used to prevent foods from drying out; for example, storing semi-dried tomatoes in oil or pouring a layer of melted butter over pâté.

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

*Fats and oils are a great conductor of heat and are used in; for example a saucepan to transfer the heat from the saucepan base into the food e.g. when an onion is sautéed.*

## Question 6

Marks	0	1	2	3	4	5	6	7	8	Average
%	18	18	17	16	12	8	6	4	2	2.7

Students needed to demonstrate understanding of the role of wet and dry methods of cooking, how heat is transferred to food during cooking and the impact of these methods on the physical and sensory properties of the vegetables in the recipe supplied.

When food is cooked, heat is generally transferred by a combination of methods – conduction, convection and radiation. In conduction, the heat is transferred from the energy source (either a gas flame or electric or induction element) to the base of the saucepan. The heat is then transferred to the surface of the food where the particles that are heated collide with each other, causing friction and generating heat. Heat can also be transferred through convection currents in both liquid and air. As air or liquid heats, the molecules absorb energy and heat up, moving from a warmer area to a cooler area, creating currents and cooking the food. Food can also be cooked by radiation, in which heat rays pass directly from the heat source to the food through electromagnetic or infrared waves.

The wet and dry techniques used in cooking the pumpkin soup include roasting, sautéing/frying, boiling and simmering. When the pumpkin is roasted it is cooked uncovered in an oven using a small amount of fat or oil. A combination of convection currents and radiation generate heat and cook the pumpkin. When the onion and garlic are lightly fried (or sautéed) they are cooked quickly in fat or oil. This is a dry method of cooking, during which the fat or oil conducts the heat to the onion and garlic, causing it to soften and develop flavour. In cooking the soup, boiling is used to bring the liquid to a high temperature. Boiling is a wet method of cooking food in liquid at a temperature of 100 °C. As the mixture boils, large bubbles will appear on the surface of the liquid and it will move rapidly. Once boiling point has been reached, the heat is reduced and the soup is allowed to simmer. Simmering is cooking food at a temperature of 85 °C and small bubbles will appear around the sides of the saucepan.



As the pumpkin is roasted the flesh is softened and browned or caramelised and the flavour developed. When sautéed/fried, the onion and garlic soften and become translucent. On further cooking they may start to brown and develop a more intense flavour. The starch in the potato is softened during simmering and the potato begins to break down and will thicken the soup. Finally, the fibre in the celery begins to soften, the celery becomes translucent and a sweet flavour is added to the soup.

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

*Both dry and wet methods of cooking are used in the making of the roasted pumpkin soup. The first method used is a dry method known as roasting. This is done with cooking food at a high temperature 200°C in two tablespoons of oil inside an oven and uses convection and conduction to cook the pumpkin. Convection heat is the transfer of heat to a food through water or air as the molecules move from a warmer area to a cooler one in the oven. As well radiation, browns the food as the heat is radiated from a source. During roasting the pumpkin goes a golden brown colour and may have darker areas. The pumpkin goes from hard to soft and its flavour and aroma becomes stronger. The next method is frying which is another dry method although done with a small amount of oil. The onion and garlic will have more powerful flavours and aromas. They will soften as the heat is conducted through the bottom of the pan, heats the oil and heat is transferred to the food. The potato and celery are added and lightly fried to develop flavour.*

*The next two and final methods of cooking are wet methods. Both are done through the use of conduction through the saucepan. Boiling occurs at 100°C and the food (pumpkin, thyme and stock) is heated and cooked due to rapid bubbles that are produced when the heat generates convection currents. This breaks down the structure of the food as the vegetables soften as the starch in the potatoes breaks down and the cellulose in the other vegetables softens. It is then reduced to a simmer 80°C- 85°C which helps stabilize the products in the saucepan and ensuring they still cook, without burning as there are only small bubbles around the edge of the saucepan. Flavours would be mixed together as the vegetables break down and the soup would thicken. The soup will have a smooth texture and good flavour after being blended.*