

A-LEVEL

# Design and Technology: Food Technology

Unit 3 Design and Manufacture (FOOD3)  
Mark scheme

---

2540  
June 2014

---

Version : 1.0 Final

---

---

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from [aqa.org.uk](http://aqa.org.uk)

## Section 1

### Question 1

- 01 In order to reduce the health problems associated with obesity it has been suggested that the price of ‘unhealthy’ foods is increased. This has become known as ‘the fat tax’. To what extent do you think that this would be an effective way of improving the health of the United Kingdom?**

**[10 marks]**

Any relevant point, plus any relevant example will be given credit.

Possible answers could include:

- Examples of ‘unhealthy’ foods
- Explanation of what constitutes an ‘unhealthy’ food
- Explanation of health problems associated with obesity, such as arthritis, heart trouble, dental caries, type two diabetes, etc.

#### **Arguments Against:**

- If people have problems with over eating, this may be due to lifestyle or state of mind. Increasing the price of certain foods may not have any effect at all. Over eating may be seen to compare with smoking or drinking alcohol in that it could be compulsive.
- It may work if prices become out of range for the consumer, but people may find other options, which may be equally as bad. For example, if fatty foods are taxed, people may turn to sugary foods instead.
- Some consumers may feel this is unfair on those who are not obese but having to pay more for items which they like purchase as a treat.
- Applying tax does not decrease the popularity of the food.

#### **Arguments For:**

- Perhaps the only way is to educate people into making better food choices.
- It could have an effect, especially if it is well publicised.
- It may help to make people more aware of the foods which are ‘bad’ for them, i.e. foods high in calories, saturated fat and sugar.
- Follow up information and advice from various bodies might be the answer to tackling the obesity problem
- Manufacturers may decide to review their product development in the light of this tax and design healthier foods as a result.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
No response worthy of credit	<b>0</b>
A limited response which covers simplistic points (which do not state more than the obvious). The answer lacks strong and relevant argument.	<b>1 - 3</b>
A reasonable answer which covers the main issues. Argument is made. Supporting examples may be given.	<b>4 – 7</b>
An excellent understanding of the issues. The argument is well considered showing originality. Relevant examples may be given.	<b>8 - 10</b>

**02 Describe how Quorn is made.****[6 marks]**

Quorn is derived from *myco-protein* which comes from a tiny plant called *Fusarium venenatum*. The plant has been around for thousands of years and occurs naturally.

Production is as follows:

1. *Fusarium venenatum* is grown in a large fermenter which has been sterilized and filled with water and glucose. The liquid is heat treated by pasteurisation.
2. The pH is regulated and nutrients are added (potassium, magnesium, phosphate and other trace elements).
3. The process results in the formulation of myco-protein solids (The principle is based upon waste carbohydrate material being converted by some fungi to proteins).
4. The myco-protein solids are harvested every 5-6 hours by being pumped from the fermenter to a centrifuge where it is separated from the liquid and chilled, having been heated to 65C to break down nucleic acid.
5. A creamy looking dough results, which is mixed with egg albumin and flavorings.
6. The dough is steam cooked for 30 minutes, chilled, chopped and minced.
7. The product is frozen, which is crucial as ice crystals help push the fibres together, creating bundles that give the meat-like texture.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
No response worthy of credit	<b>0</b>
A basic understanding which outlines a few credible points.	<b>1 – 2</b>
A reasonable answer, which shows understanding but lacks depth and detail about the process. There may be some inaccuracies.	<b>3 – 4</b>
A full answer showing excellent understanding of the process. Accurate information and correct use of technical terminology.	<b>5– 6</b>

**03 Name six micro nutrients found in Quorn.**

**[6 marks]**

**Minerals:**

- Calcium
- Magnesium
- Zinc
- Iron
- Potassium
- Phosphorus
- Sodium

**Vitamins:**

- Vitamin B1 Thiamin
- Vitamin B2 Riboflavin
- Vitamin B3 Niacin
- Folate/Folic Acid
- Pantothenic acid

Candidates will be rewarded one mark for each correct response up to a maximum of 6 marks. Although Potassium and Magnesium are not listed in the specification, they will be rewarded if listed by candidates as they are micro-nutrients essential to the body and present in Quorn. No explanations are required.

**04 Explain why microbial risk assessments have to be carried out in food production.****[6 marks]****Microbial Risk Assessment**

- Manufacturers have a statutory responsibility to their consumers to ensure that the products they produce are of a high standard and are fit for human consumption.
- They also have a commercial interest in ensuring that their reputation remains untarnished.
- They must avoid incidents of food contamination leading to possible food poisoning outbreaks.
- In order to regulate their practices, microbiological testing is built into the manufacturing process as part of the Quality Assurance programme. This enables the manufacturer to sample each batch of food products to check for any contamination and, using traceability and the HACCP program, identify its source.
- If a batch proves to produce too many undesirable bacteria, producing dangerous levels of toxins, the batch can be removed from the shelves until the contamination source is identified and the problem rectified.
- Microbial analysis of food products helps microbiologists to work out the 'Sell By' and 'Use By' date which protects the manufacturer from litigation.
- Reward should be given for explanations of litigation, breaking the law, running the risk of fines, closure or being shut down.
- **Risk assessment** is the starting point for a food manufacturer in terms of Food Safety. Risk means assessing any risk to a food product during its production. This involves working out what chances there are of a food being damaged or made incorrectly. Risk assessment is therefore thinking about what could happen and planning to prevent it from happening.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
No response worthy of credit	<b>0</b>
The points given are likely to be general and unjustified. There may be confusion and basic understanding of risk assessment.	<b>1 – 2</b>
A reasonable answer, which shows understanding but lacks depth and detail about risk assessment. There may be some inaccuracies.	<b>3 – 4</b>
A full answer showing excellent understanding of risk assessment. Accurate information and correct use of technical terminology.	<b>5 – 6</b>

## Question 2

05 Explain, in terms of food science, the working characteristics of ingredients when producing the following:

[3 x 6 marks]

- cheese sauce made by the roux method
- choux pastry
- Victoria sandwich cake.

Allow up to a maximum of 6 marks for relevant points made in relation to each of the products listed above. Candidates do not have to cover all of the points below to gain the six marks. N.B. Reward is given to responses relating to working characteristics, not sensory characteristics.

### Cheese Sauce made by the roux method:

- Fat *melts* and *absorbs* the starch from the flour.
- The starch partially *gelatinises* as it absorbs the moisture from the fat, upon the action of *dry heat*.
- The liquid from the milk is absorbed into the *panada* and is beaten in gradually on and off the heat to ensure even absorption and to prevent uneven gelatinisation of the starch which would produce lumps.
- At around 80 °C the starch fully gelatinises and the sauce *thickens*.
- Allow candidates reward for a full explanation of gelatinisation (starch grains absorbing moisture, swelling and *rupturing* to release the starch grains etc.)
- Cheese is added once the sauce has gelatinised and it melts evenly when stirred and any fat released from the cheese will be incorporated into the starchy sauce, producing a smooth and glossy appearance.
- If overheated the cheese will *coagulate* and *harden*, producing lumps.

### Choux pastry:

- The fat is gently melted into the water in a saucepan, whereupon the sifted flour is added and beaten rapidly to prevent the formation of lumps.
- As the water is warm, the flour instantly *gelatinises* and thickens.
- The egg is slowly worked into the flour, a little at a time, being beaten vigorously to ensure it is evenly distributed.
- The egg produces a glossy appearance and within the mix, *gluten* strands are formed as the flour is beaten.
- A chemical raising agent such as baking powder is not required as the raising agent for Choux pastry is *steam*.
- The paste is piped into shapes onto a greased baking tray and placed into a very hot oven at a minimum of Gas mark 6 or 200°C.
- The water content from the water gradually turns to *steam*, where it *expands* and pushes up the starchy mixture, which in turn continues to *gelatinise*.
- The protein in the egg begins to *coagulate* at around 60-66°C and this gives the risen choux pastry stability and strength.
- The starch on the outside of the pastry *dextrinises* causing the golden brown appearance.
- The *Maillard* reaction may also take place as proteins and dry heat is present, adding to the browning of the pastry.
- The choux shapes are slit towards the end of the cooking time in order for steam to escape. This drying out from the inside prevents the choux from going soggy and helps

to maintain the shape.

**Victoria sandwich cake:**

- The butter and sugar are creamed together to form a *matrix* which *holds/traps* air.
- This action removes any lumps and increases the *volume*. The colour lightens.
- Eggs, at room temperature, are beaten and gradually mixed in to the sugar and fat mix. This forms an *emulsion*, which can sometimes start to *curdle* if the eggs are too cold (separate out). To prevent curdling, a little sifted flour is added, acting as a *stabiliser*.
- The flour is sifted and folded in to the mixture. This helps to prevent the gluten in the flour from forming and thus keeps the cake soft and spongy.
- The cake is cooked in two lined tins in the middle of a moderate oven until it is well risen, dextrinised on the outer crust and firm to the touch.
- Baking powder in the SR flour produces CO<sub>2</sub> once it comes into contact with moisture and heat. This gas expands upon heating and pushes up the starchy structure of the cake.
- The starch absorbs the moisture from the eggs, which, together with the dry heat, helps it to gelatinise.
- The protein in the eggs coagulates as the temperature increases to around 60-66°C, helping to form the firm structure of the cake.
- The sugar caramelises, producing a brown colour.
- The fat melts and provides moisture which aids the keeping qualities of the cake.

**NB:** Candidates may repeat certain key words and principles in each of these examples. They should be credited for correct use of terms and principles in relation to each example, so long as the explanation and usage is relevant to that example.

Criteria for marks awarded	Mark range
No response worthy of credit	<b>0</b>
A basic understanding of the food science involved. Only the most obvious points given. There may be some confusion and little use of technical terms, or terms may be inaccurately used.	<b>1 – 2</b>
A reasonable answer, which shows understanding and some accurate use of technical terms but there may be omissions or inaccuracies.	<b>3 – 4</b>
A full answer showing excellent understanding of food science. Technical language is evident and appropriately used	<b>5 – 6</b>



**06 Explain the term ‘complementation of proteins’. Give specific examples in your answer.****[6 marks]**

- The term ‘complementation’ refers to the intake of a variety of LBV proteins, which, when ‘mixed and matched’ complement the deficient amino acid content of the other. If eaten together they will supply all the essential amino acids.
- Of the 20 amino acids commonly found in proteins, eight (nine in children) are essential in the diet. These essential amino acids must be supplied by the protein in the diet because they cannot be synthesized by the body.
- The non-essential amino acids can be synthesized in the body by converting one amino acid into another within the body cells.
- The essential (indispensable) amino acids: Isoleucine, Leucine, Lysine, Methionine, Phenylalanine, Threonine, Tryptophan, Valine, (Histidine and Arginine - indispensable for children).
- The *Biological Value* of protein is used as a measure of protein quality. BV is the percentage of absorbed protein which is converted into body protein. Therefore, proteins that contain more of the essential amino acids and which are of higher BV are of more use to the body.
- Animal sources of protein are very high in BV. Vegetarians, particularly vegans, will need to consume vegetable sources of protein, which tend (with the exception of soya) to be LBV. They need therefore to eat a varied number of LBV proteins to ensure that in one meal the essential amino acids are obtained, e.g. beans on whole meal toast, dhal and rice, peas and rice. Accept other accurate examples, or terms such as ‘mixing and matching’. Allow up to 2 examples.

NB: Examples could be taken to be food related e.g. ‘peas and rice’, or named amino acids e.g. Leucine. (Do not give a mark for each individually named amino acid however).

<b>Criteria for marks awarded</b>	<b>Mark range</b>
No response worthy of credit	<b>0</b>
A limited understanding of the term. The candidate does not explain in very much detail. There may be no examples given.	<b>1 - 2</b>
A generally good understanding with examples given. The candidate is able to offer a reasonable explanation of the term. There may be some inaccuracies and omissions.	<b>3 - 4</b>
A full and detailed answer, which is likely to include several examples and clear explanation.	<b>5 - 6</b>

**07 Explain why the following are used in food manufacture:**

- **anti-foaming agents**
- **anti-caking agents.**

**[2 x 2 marks]**

**Anti-foaming agents**

These are added to liquids which have to be poured or pumped in a factory, such as milk or fruit juices. The anti-foaming agent does what it says; it prevents the build-up of air bubbles or foam as the liquids are poured. If they were not used, pipes would clog up, become blocked and leakages and wastage would occur.

**Anti-caking agents**

These absorb moisture from dried foods without themselves becoming wet. They are used in dry products to ensure the substances flow freely, for example, salt thus maintaining the desired texture. Examples of anti-caking agents include: silicates, calcium phosphates, magnesium oxide, salts from some long chain fatty acids such as stearic and palmitic.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
No response worthy of credit	<b>0</b>
A limited attempt to explain the usage but an accurate point is made.	<b>1</b>
A good response with a clear an accurate explanation.	<b>2</b>

### Question 3

08 With the aid of diagrams, describe the basic chemical structure of the following:

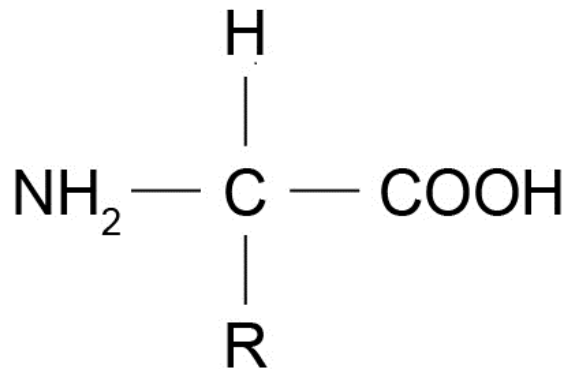
- amino acids
- fatty acids
- either alpha or beta glucose.

[3 x 4 marks]

In order to gain full marks a diagram must be included.

#### Amino acids:

Always contain an amino group (-NH<sub>2</sub>) and a carboxyl group (-COOH). The general formula is:



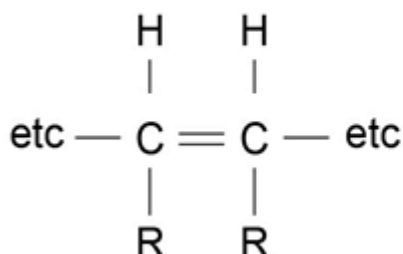
- Allow reward for amphoteric
- The R group will vary in each amino acid. The simplest amino acid is when R=H (glycine).
- Reward to be given for naming the elements which make up the amino acids: N CHOPS

#### Fatty acids:

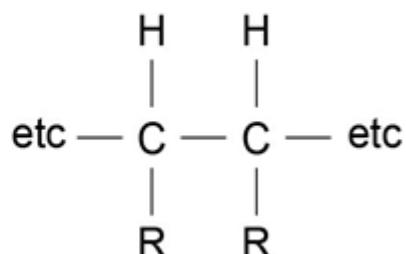
- Fatty acids are made up of molecules of Carbon, Hydrogen and Oxygen.
- These are either known as 'Saturated' or 'Unsaturated'
- Saturated fatty acids consist of an acid group (-COOH) plus carbon and hydrogen sometimes in long chains. Each carbon atom is attached by single bonds to the next atom.
- Unsaturated fatty acids contain at least one double bond between two adjacent carbon atoms. The double bonds are a point of weakness, and not strength, and they can be more easily broken down than saturated fatty acids.
- The terms **saturated**, **mono-unsaturated**, and **poly-unsaturated** refer to the number of hydrogens attached to the hydrocarbon tails of the molecule.
- General formula: RCOOH

Candidates may draw either or both of these diagrams:

### Unsaturated fatty acid



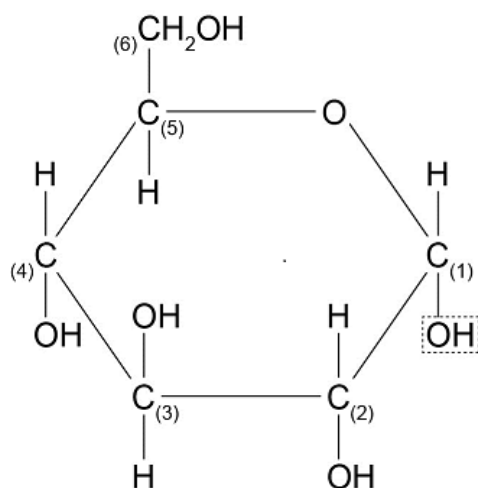
### Saturated fatty acid



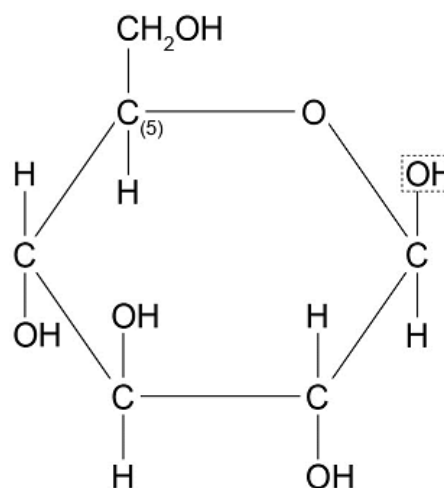
### Alpha or Beta Glucose:

- The formula  $\text{C}_6\text{H}_{12}\text{O}_6$  refers to any monosaccharide with six carbon atoms, including glucose.
- The  $\alpha$ -glucose has the hydroxyl group (OH) on carbon atom 1 at the bottom
- The  $\beta$ -glucose has the hydroxyl at the top
- NB – this is the only difference between the two glucoses.

#### $\alpha$ -glucose



#### $\beta$ -glucose



Criteria for marks awarded	Mark range
No response worthy of credit	0
Little or no understanding of the chemical structure. Diagrams are not representative of the molecule. Description is likely to be confused and/or minimal.	1
Some attempt is made to describe the chemical structure with diagram(s) but there may be confusion or inaccuracies.	2 - 3
Accurate diagram(s) which are clear and well communicated together with supporting descriptions.	4

09 Look at the menu below:

<p><b>Cream of tomato soup</b></p> <p><b>Shepherd's pie with mashed potatoes, honey glazed carrots, buttered cabbage and beef gravy</b></p> <p><b>Summer fruits cheesecake</b></p>
--

Describe how you could adapt the menu to suit each of the following diets. Give reasons for each adaptation.

- **Coeliac**
- **Lactose intolerant**
- **Low cholesterol**
- **Vegan**

**[4 x 4 marks]**

Candidates should show some understanding of the particular needs. This may either be explained as an introduction to the response or might be evident through the explanations given as they work through the question.

NB: Award a mark for each relevant and justified point made to a maximum of 4 marks per diet. The suggestions below are not exhaustive.

**Coeliac:**

- Any mention of removing or substituting wheat flour which contains gluten, such as thickening in the soup and gravy; biscuits used in the cheesecake base.
- Give credit for substitute foods or creative adaptations to the recipe or menu.
- Allow one mark only when candidates talk about using 'gluten free' flour etc.

**Lactose Intolerant:**

- Any mention of removing or substituting dairy products which contain lactose such as milk, cream, yoghurt - such as cream in the soup, milk or cheese in the mashed potatoes, butter in the glaze, cream or cheese in the cheesecakes.
- Give credit for substitute foods or creative adaptations to the recipe or menu or a suitable, well justified and considered alternative dessert – not just 'fruit' or a random alternative with no explanation.
- Allow one mark only when candidates talk about using 'lactose free' etc. They must give a specific example or substitute.

**Low Cholesterol:**

- Any mention of removing or substituting high cholesterol foods such as animal products – such as cream in the soup, milk or cheese in the mashed potatoes, beef fat, butter in the glaze, cream or cheese in the cheesecakes.
- Reward discussion centred around High Density and Low Density Lipoprotein and the importance of controlling LDL levels, including intake of small quantities of HDL.
- Give credit for substitute foods or creative adaptations to the recipe or menu.
- Allow one mark only when candidates talk about using 'fat free' etc. They must give a specific example or substitute.
- Note that the question is focused upon 'low cholesterol' not 'low fat', so candidates must be able to distinguish between these.

**Vegan:**

- Any mention of removing or substituting animal products such as milk or cream in the soup; meat in the Shepherds' pie; animal cooking fats; cheese, milk or butter in the mashed potato; butter as a glaze; whey powder as a stabiliser or egg lecithin as an emulsifier in the cheesecake possibly; cream or cheese in the cheesecakes, etc.
- Give credit for substitute foods or creative adaptations to the recipe or menu.
- Allow one mark only when candidates talk about using 'animal product free' etc. They must give a specific example or substitute.
- Honey – Vegans don't eat honey as a rule because bees are destroyed.

## Section 2

### Question 4

- 10 How far do you agree that food products that claim to have health benefits are actually beneficial? Give examples to illustrate your answer.**

**[10 marks]**

Any appropriate response will be credited. Candidates may provide a variety of different arguments, to be credited the candidate's argument must be supported with evidence or examples. Areas that may be covered are as follows:

- Vitamin supplements (*e.g. These could prevent a deficiency from occurring, such as Vitamin D levels depleting during the winter months as a result of lack of sunshine, but equally, overdoing Vitamin A can be very dangerous to health causing side effects such as dizziness, nausea, drowsiness etc.*)
- Low fat products
- 'Free from' products
- Sugar free products
- Energy drinks
- Cholesterol reducing products
- Pre and pro-biotic products
- Anti-oxidant foods
- Super foods
- Omega enriched foods
- Fortified foods and drinks
- Functional foods
- Named products will be rewarded, but explanation of their function is required.

Candidates will be expected to identify the 'health benefit' claimed; give example(s) of the food or food product which is claimed to provide the benefit and then discuss the case. It is expected that candidates will cover several different food products in this question.

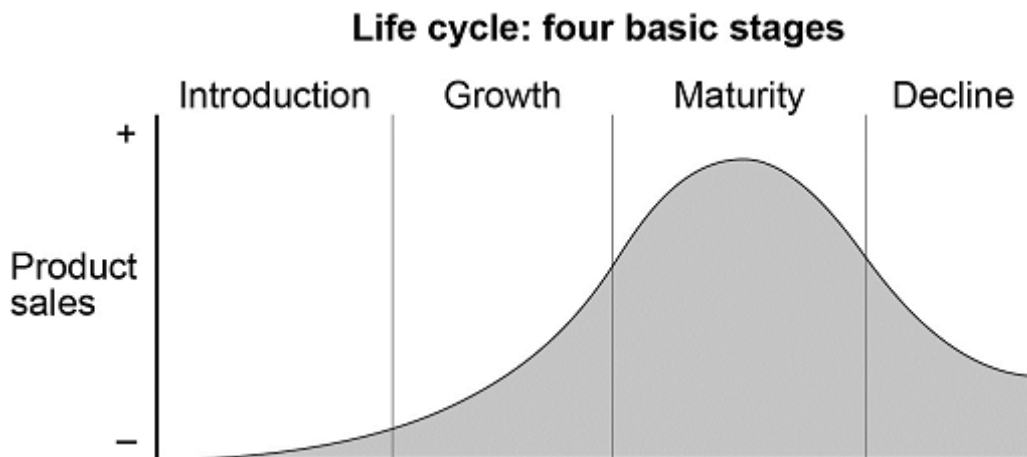
Criteria for marks awarded	Mark range
No response worthy of credit	<b>0</b>
A limited response which considers only the most obvious points, with little in the way of explanation, examples or justification. The candidate may not fully understand the question.	<b>1 - 3</b>
A reasonable response which provides some good examples and a good level of explanation and justification. More than one product is discussed, possibly not all in detail.	<b>4 - 6</b>
An excellent response which is well informed, perceptive and original, with sound explanation and justification. Several products are discussed, or two or more in detail.	<b>7 - 10</b>

**11 Describe the typical stages in the life cycle of food products.****[10 marks]****Life cycle:**

This is from launch (introduction) to growth, to maturity and then decline. Candidates may include the product life cycle diagram, which can be credited according to the accuracy and amount of added detail included in it. This is not a requirement and the question can equally be answered in continuous prose however.

Candidates will need to name **and** annotate the diagram or talk about it within their responses in order to make it relevant and to demonstrate their descriptions of the stages.

If candidates correctly identify the four distinct stages, they should be rewarded by at least one mark for each stage so long as they describe the stage.



- Manufacturers plan for life cycles, often predicting how long a product will be profitable. Extension strategies. Being 'pre-active' (ahead of completion). Asset-led marketing (take a product's good points and use them to aim towards another market).
- Life cycles are extended by some of the following methods: Reviewing the outcome: Learning lessons, looking at feedback, continuous improvement, further market research, looking at competitors, examining possible product extensions and other future developments, e.g. developing 'ethical' versions or 'healthier' versions, new or novel packaging, different preservation methods, sources and types of ingredients, travelling the world to develop ideas further, etc.
- Marketplace intelligence; watching what is going on in the market. Observing what other companies are doing, new launches etc. Seeing what is happening in world markets. How does a particular product appeal outside the U.K?
- Observing 'healthy trends'. Making adjustments in line with healthy eating guidelines, e.g. '90% fat free'.
- Observing topical and ethical trends e.g. use of organic / Fair Trade ingredients
- Qualitative research which is used to assess product (or project) viability.
- The need to work creatively in the design or re-launch of a product.
- The need for new products and the need to maintain interest in them. Examples might include the extension of a Brand, such as Mars Bars; to produce various sized bars, different thickness of chocolate coating, different flavourings, ice creams, cake bars etc.



- The fact that risk is unavoidable, e.g., trying to meet a perceived need rather than a real one. Creating modern / trendy products that attract consumers and entice them.
- The concept of Added Value.

Criteria for marks awarded	Mark range
No response worthy of credit	<b>0</b>
A limited response which may be confused. Little accurate information is given and the stages may not be identified.	<b>1 - 3</b>
The response covers some or all of the stages and some attempt is made to describe the concept of life cycle. The answer may be a little confused in places and may lack detail.	<b>4 - 7</b>
A full response which describes all the typical stages in some detail. Examples may be given and the answer is clearly described. Good use of technical terms and original thought evident.	<b>8 - 10</b>

**12 How is computer-aided design (CAD) used in the development of new food products?**

**[8 marks]**

**CAD** packages are used to:

- Produce drawings or to use images in such things as product profiles and design ideas
- Nutritional analysis and nutritional modelling
- Packaging nets
- Food labels
- HACCP design and system design
- Estimation of microbial growth
- Costings - scaling up
- Market research data
- Microbiological modelling

Any well-reasoned and explained use will be credited, as will supporting examples.

Criteria for marks awarded	Mark range
No response worthy of credit	<b>0</b>
A limited response which covers only the most obvious points. The answer lacks depth, detail and content.	<b>1 - 3</b>
Some attempt has been made to describe the uses of CAD. Several examples may be given, with explanation which may not be detailed. There may be some omissions.	<b>4 - 6</b>
A full and detailed response which covers a wide range of points, which are well explained and may be supported by examples.	<b>7 - 8</b>

---

## Question 5

- 13 **‘Sustainability, seasonality and environmental friendliness are important factors in farming, production and transportation of food ingredients and food products.’**

**Discuss the issues associated with this statement.**

**[8 marks]**

Any well argued and justified response will be credited. Candidates may focus upon some or all of the issues. The mark scheme below outlines some of the areas candidates may touch upon:

Candidates will be expected to discuss the world market and influences associated with a narrowing of borders and world trade barriers. Issues could include:

- Air miles: the ethics associated with transporting salad ingredients and vegetables great distances at a huge environmental cost.
- Consumer expectations and demands that are not always ethically or environmentally sound, such as the desire for out of season food, the desire for cheap and plentiful products, the desire to eat the same foods they may have eaten in some far away region of the world at a reasonable price.
- Supermarkets selecting the most efficient suppliers to suit their specifications - even if the food has to be driven many miles to reach their shops.
- Crop rotation to ensure the earth is farmed sustainably. Putting back into the earth what is taken out.
- Organic and Vegetarian movements.
- The 'take away' and 'throw away' culture, affecting resources and polluting environments with litter.
- An unwillingness to cook from raw ingredients. Reliance upon supermarkets to provide ready meals.
- The desire for 'perfect' looking products and a reluctance to grow vegetables and fruit at home.
- Fair Trade and the growing desire to pay a fair price to the producers (in the UK as well as abroad).
- A strong movement, led by the Co-Op, as well as others, for manufacturers to label, design and produce food products fairly and honestly.
- A growing awareness of other countries' ethical standards, e.g. the heavy use of chemicals in other countries used on foods destined for Britain.
- Over fishing, reducing fish stocks.

Factories are encouraged through various Government grants and through public pressure to consider the environment. It is in their interests to make their manufacturing processes as efficient as possible. Ways of doing this could be:

- To work with reusable energy sources such as solar power, sonar power, wind power.
- To recycle supplies of waste hot water for heat transfer into heating or washroom systems.
- To create an attractive environment around the factory for locals and workers to enjoy
- To use natural light effectively, to cut down on the need for electricity
- To use ecologically sound building materials that will not emit contaminants to the environment (e.g. asbestos)

- To adopt modern day manufacturing processes that emit low levels of noise
- To create a pleasant working environment within the factory to reduce stress levels for workers and to increase their productivity
- To adopt effective systems of health and safety to protect workers
- To recycle waste materials and use recycled packaging materials wherever possible

<b>Criteria for marks awarded</b>	<b>Mark range</b>
No response worthy of credit	<b>0</b>
A limited response which covers only the most obvious aspects. Discussion is basic and examples may be sparse.	<b>1 – 2</b>
A reasonable attempt to cover the issues. There will be some good discussion but this may lack breadth and depth.	<b>3 – 5</b>
A full and detailed discussion which covers a wide range of points, supported by good argument and examples. The response is likely to be original, making very good use of synoptic thought.	<b>6 – 8</b>

**14 Explain why each of the foods below have such a long shelf life:**

- **cartons of orange juice that can be stored at room temperature**
- **canned sweet corn**
- **bottled chutney**
- **dried sultanas.**

**[4 x 3 marks]****Carton of Orange Juice:**

- Ultra Heat Treatment (Ultra High Temperature): Food is heated to temperatures in excess of 100°C in plate heat exchangers to ensure that spores are destroyed.
- Some processes involve temperatures of around 130°C for only a matter of a few seconds.
- The juice is packaged under aseptic conditions.
- Packages are hermetically sealed. The packaging materials used are robust and prevent entry of air unless opened or pierced.
- The products can be stored in room (ambient) temperatures for up to 6 months usually and do not require refrigeration.
- Until the package is opened the product remains in sterile conditions and is therefore preserved.

**Canned sweet corn:**

- The corn blanched in water at boiling point, to kill bacteria and denature enzymes. This prevents enzymic action taking place once the corn is sealed in the can.
- The canned corn is heated to kill any remaining bacteria, often in a mild brine solution, which will also make it difficult for bacteria to multiply. 121C for 3 minutes.
- The air is pushed out of the can as it is heated and then hermetically sealed, producing a vacuum within the can.
- The lack of air means lack of oxygen available for bacterial activity.
- Until the can is opened (or damaged) the corn remains in sterile conditions and is therefore preserved.

**Bottled Chutney:**

- Addition of an acid (e.g. vinegar – acetic acid) plus sugar which removes available moisture, osmotic effect.
- Acids affect microbial cells by hydrogen ions produced, damaging membranes and other surface layers of the cell.
- Adjusting the pH of foods using organic acids controls the growth of both food poisoning and food spoilage bacteria.
- Foods with a pH below 4.2 are normally considered safe in relation to the growth of pathogenic bacteria.

**Dried Sultanas:**

- Micro-organisms cannot live and grow and reproduce without moisture. Dried foods therefore are not likely to support the growth of harmful micro-organisms, so have a long shelf life if packed in an airtight container.
- The removal of water from food means that the concentration of sugar increases, which inhibits the growth of micro-organisms.
- As water is drawn out of the cells by osmosis, micro-organisms cannot survive.

- Enzymes require less moisture to remain active. This is why some commercially dried foods have to be blanched to kill the enzymes before drying.
- Sulphur can be added to aid preservation, preventing micro growth.

N.B. Candidates should be rewarded for showing understanding of the conditions required for bacterial growth within each example.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
No response worthy of credit	<b>0</b>
A limited response which contains little or no explanation.	<b>1</b>
Some explanation which explains up to two points clearly or more than two points briefly.	<b>2</b>
A full explanation with three or more points explained. Good understanding of the principles evident.	<b>3</b>

**15 What might a manufacturer consider when setting up systems in a food factory to ensure that food products are always of a consistent and uniform quality?**

**[8 marks]**

Consistency and accuracy are to be achieved as a result of several things:

- Good Quality Control and Quality Assurance systems in place
- Regular monitoring of processes and machinery
- Good product and machinery design
- Accurately formed cutters and moulds
- Uniform quantities of mixture extruded
- Well formulated recipes that have been tried and tested before large-scale manufacturing commences
- Detailed and accurate specifications with carefully monitored tolerances
- Well trained operators
- Good engineering and maintenance team
- Regular measurement checks of weight or volume
- Temperature checks of tolerance limits
- Sensor detectors for metal or foreign bodies
- Random sampling
- A Total Quality Management (TQM) system in place
- British Standard Number BS5750
- European Standard ISO9000 for quality management systems
- Customer relations and complaints procedures.
- Use of CAD/CAM requires a specific example related to the question.

Any well explained and relevant point will be credited.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
No response worthy of credit	<b>0</b>
One or two basic points are made but the answer lacks depth and full understanding.	<b>1– 2</b>
A reasonable understanding of the considerations. Points made are clear but the response may lack depth and full explanation.	<b>3 – 5</b>
An excellent understanding of the considerations and systems used. The answer is supported by relevant examples and may contain originality, technical terms and sound explanations.	<b>6 – 8</b>

**Question 6**

- 16 In times of recession and economic hardship, people tend to spend more money on food for home consumption.**

**Explain why you think this may be so and suggest, with reasons, food choices which might be popular.**

**[12 marks]**

**Explanation:**

Any well explained and relevant response will be credited.

Examples of responses may include:

- The human need to ensure that the essentials of life are catered for in times of hardship – food being one of the most significant. People think more closely about keeping stocks of food at home, just 'in case'.
- Having food stores full helps people to feel more secure.
- People go back to 'basics', making things themselves, such as bread, soups, and cakes.
- Baking becomes a pastime when people can't go out.
- It is cheaper to entertain visitors at home than to take them out.
- Family celebrations – as above.
- Take away food is quite expensive, so people may make the same product (e.g. fish and chips, pizza, and curry) at home using their own ingredients.

**Popular Foods:**

Any well explained and relevant response will be credited.

Examples of responses may include:

- 'Comfort Foods' such as bread, soup, stews, puddings, pies, jacket potatoes, cakes and biscuits.
- Seasonal vegetables such as potatoes, root vegetables, pumpkins, leafy greens.
- Peas, beans, lentils, pasta, grains and rice – whole foods, which may be purchased in the high street as well as in supermarkets.
- Farm shops, markets and Farmers markets selling locally sourced products such as sausages, cheese, eggs, vegetable boxes.
- 'Dine In' meal deals.
- BOGOF offers from Supermarkets.
- Basic baking ingredients such as flour, sugar, eggs, margarine, dried fruit, yeast.
- Cook-in sauces instant dessert mixes.
- Reduced items.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
No response worthy of credit	<b>0</b>
A limited response which covers the most basic points. There is likely to be little or no original thought and minimal explanation.	<b>1 - 4</b>
A reasonable attempt to suggest ideas and to justify them. The response may be limited to only a few points.	<b>5 - 8</b>
A full and well considered response which shows good understanding and originality.	<b>9 - 12</b>

- 17 Describe how food legislation helps to protect the consumer and to guide the manufacturer. Give examples to help your answer.

[8 marks]

**Protecting the Consumer:**

**The Food Safety Act 1990:** The main aim of this act is to protect the health of consumers and to prevent food fraud.

- The intention of the Act is that food shall be in as wholesome a condition as possible when it is eaten.
- The Act came first, but has been followed by subsequent secondary legislative measures.
- All of this legislation prescribes legally enforceable standards of composition and treatment and renders infringement a criminal offence.
- The Act prohibits the addition to food any substance that would make it *'injurious to health'*.
- It is also required that Ministers *'have regard to the desirability of restricting, so far as practicable, the use of substances of no nutritional value as foods or ingredients of foods'*.

The Act covers such issues as:

- Food safety (it is unlawful to sell food unfit for human consumption, or rendered harmful by the addition or removal of constituents, or by subjecting it to processes or treatments that are unreasonable. This covers microbial, foreign body or chemical contaminants).
- Substance, nature or quality (it is illegal to sell food which is inferior or substantially different to what it is purported to be, e.g. setting minimum amounts of foods for products such as fruit in fruit cocktails).
- Misleading descriptions (an offence to make a false or misleading claim on a food label or in an advertisement for a food, e.g. describing something as British when the main ingredient comes from abroad).
- Misleading presentation (this covers shape, appearance, packaging, the way things are presented for sale and the setting in which it is displayed e.g. fatty mince under red lighting to mislead consumers about its fat content).
- Individual legislation to include such things as additives, compositional standards, contaminants, hygiene and labelling.

**Food Labelling Legislation**

- Candidates are to be rewarded for descriptions related to food labelling (food safety, allergens, allergies, food storage, re-heating, GM, country of origin and manufacturer's contact details etc).

**The Food Safety (General Food Hygiene) Regulations 1995** were introduced to ensure that the same food hygiene rules are applied in all European countries. The Regulations must be adhered to by anyone who owns, manages or works in a food business.

**Weights and Measures Act:** It is of particular interest to consumers because it deals with short weight (or volume).

- It is an offence to deliver to the buyer a lesser quantity than purported to be sold or a lesser quantity than corresponds with the price charged.



- Matters related to the 'Average Weight System' and (e mark) are also covered.
- Packers are allowed a tolerance on the actual weight / volume provided the average weight in a bulk lot does not fall below that stated on the package (tolerances may be +/- 15g). This ensures the consumer gets a fair deal. Some packs may be below the tolerance, but equally, some may be above it.

**Sale of Goods Act 1979:** This states that the product should match the description given. It should be of 'merchantable quality'. It should be fit for its purpose.

**Other legislation could include: The Consumer Protection Act 1987, The Trades Description Act 1968**

### Protecting the Manufacturer:

Candidates may not have as much to say about this part of the question, but points they may make include:

- The Law provides a framework for them to work to. It helps guide them in setting up systems.
- It makes manufacturers aware of what could go wrong and as a result encourages them to set up systems to minimise risk, such as HACCP, 'Safer Food Better Business'.
- It makes them aware of possible offences and litigation. Being 'forewarned is to be forearmed'
- It encourages 'Due Diligence' which could stand in Court if they were accused of breaking the Law.
- It encourages manufacturers to be proactive, to keep ahead of their game and to cover as many eventualities as they can.
- Ultimately, adhering to the Law make sound business sense in terms of manufacturer accountability, reputation and integrity.

Do not give a mark for the title of the Act only. This must be accompanied by narrative which describes its function in relation to the question. To gain marks in the top band, protection of the manufacturer must be considered.

Criteria for marks awarded	Mark range
No response worthy of credit	0
A limited response which shows very little knowledge and understanding of the topic. The answer may not distinguish between the manufacturer and the consumer. Examples may be omitted.	1 - 2
A reasonable attempt to cover some aspects of the law. Reference is made to both the consumer and the manufacturer, but the answer may be confused in places. Some examples given.	3 - 5
A full and accurate response which covers many relevant points of Law. The distinction is made between the manufacturer and the consumer and specific examples are given.	6 - 8

**18 Discuss how far you agree with the view that people in the United Kingdom waste a lot of food.****[8 marks]**

Any relevant point which is well argued and/or justified will be credited.

Candidates may use examples from recent news articles, which can be credited.

Responses may include any of the following points:

**Arguments For:**

- People are worried about getting food poisoning and take date stamping literally, thus throwing away food before it has actually gone off.
- People buy too much food.
- People are not very good at planning ahead and working out what they actually need.
- People mainly have cars for shopping and therefore do not have to worry about the weight of food they are carrying home. If they had to carry it by hand they might not buy so much.
- People have no idea about portioning and making food 'go further'.
- People are lazy and can't be bothered to trim off food which may have wilted outer leaves etc so they just throw it away.
- Many people do not have a conscience about food waste.
- People on the whole have enough money and don't have to worry about wasting food.
- Many people don't know how to use left-over food properly.
- Using left – over food is seen by some as being old fashioned and a bit 'weird'.
- Many people are ignorant about correct and safe storage of food.
- Many people do not rotate the food they have in their fridges and store cupboards so it goes out of date.

**Arguments Against:**

- People who were brought up in war time were taught not to be wasteful and were very good at using up left over food.
  - Rechauffage cookery used to be taught in schools.
  - Celebrity chefs are starting to focus upon the use of left-over food and being economical, which is making it more socially acceptable.
  - Many people think that left over food tastes better.
  - Some people deliberately cook more food than they need one day so that they can eat the left overs the next day, to save time and fuel.
  - Some people cannot afford to waste any food because it is so expensive.
  - More and more people now are relying on food parcels, which is changing attitudes to food waste.
  - With refrigerators, there is no need to waste food as it can be stored for longer.
  - Some religions and cultures encourage people to treat the food they have with gratitude.
  - To waste food is like throwing money away. It does not make economic sense.
- N.B. suggested uses of left over food to reduce waste will be rewarded.

---

<b>Criteria for marks awarded</b>	<b>Mark range</b>
No response worthy of credit	<b>0</b>
A limited response. There is likely to be little reasoning or justification and the points made may only state the obvious.	<b>1 – 2</b>
A reasonable attempt which may consider arguments both for and against the proposition. The candidate offers some examples and may show some originality.	<b>3 – 5</b>
A full and well considered response which poses may differing arguments for and against. There is evidence of original thought and examples are relevant. The candidate may make reference to topical issues and articles from the press.	<b>6 – 8</b>