

General Certificate of Education

Design and Technology: Food Technology

Mark Scheme – FOOD3

Specimen mark scheme for examinations in June 2010 onwards
This mark scheme uses the [new numbering system](#)

The specimen assessment materials are provided to give centres a reasonable idea of the general shape and character of the planned question papers and mark schemes in advance of the first operational exams.

Mark schemes are prepared by the Principal Examiner. Alternative answers not already covered by the mark scheme are legislated for and will receive credit if appropriate.

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GCE Food Technology Unit 3**SECTION 1****Q1**

The new Nutritional Standards for Secondary School Lunches (2006) state that:

- *At least one portion of salad or vegetables **and** fruit should be provided per day per child*
- *A protein food (meat, fish, egg, nuts, pulses or beans – not including green beans) should be available on a daily basis*
- *Red meat should be available three times a week*
- *Fish should be available twice a week (oily fish at least once every three weeks)*
- *Manufactured meat products may be served occasionally, provided they meet legal minimum meat levels*
- *A food from the starchy food group (bread, pasta, noodles, rice, potatoes, yams, millet) should be available on a daily basis*
- *Fat should not be used in the cooking process of starchy foods on more than three days in any week*
- *Meals should not contain more than two deep-fried items in a single week*
- *Milk or dairy foods should be available on a daily basis*

01 Using your knowledge and understanding of human nutrition, explain why these nutritional standards were introduced.

Candidates are expected to analyse the information and outline their understanding of 'balance' in relation to the nutrients consumed. It is expected that they will refer to all the macro and most of, if not all, the micro nutrients. To gain full marks, candidates should justify their responses, making use of the examples given. They must demonstrate a sound understanding of human nutrition. Exceptional candidates may make reference to current nutritional thinking, including information about foods which should be eaten in combination with other foods.

Criteria for marks awarded	Mark Range
Candidate shows only a basic and somewhat superficial understanding of human nutrition and makes obvious and sometimes unsubstantiated or inaccurate comments, with little justification. Candidates express straightforward ideas clearly, if not always fluently. Arguments stray from the point on occasion or may be weakly presented.	0 – 6
A reasonable attempt. The candidate has a good understanding of human nutrition and is able to cover the most important points. The response is largely justified though there may be areas of weakness in terms of knowledge and understanding. Candidates express moderately complex ideas clearly and with reasonable fluency, through well linked sentences and paragraphs. Arguments are generally relevant and well structured. There may be occasional errors of grammar, punctuation and spelling.	7 – 12
A full and well explained response. The candidate covers the question thoroughly, displaying a sound knowledge and understanding of human nutrition. The candidate may include topical information and is likely to make links between different concepts. Candidate has expressed complex ideas extremely clearly and fluently. Sentences and paragraphs follow on from one another smoothly and logically. Arguments are relevant and well structured. There are few, if any, errors of grammar, punctuation and spelling.	13 - 18

(18 Marks)

02 Explain, with examples of diet related illness, the relationship between diet and health.

It is expected that candidates will make reference to the following:

- Energy balance: effects of excess intake of energy-providing foods (obesity) and/or deficiency (weight loss). (Candidates may discuss disorders such as anorexia nervosa which strictly speaking are psychological problems rather than diet related. However, if they make reference to deficiencies in their response they will be credited).
- Macro-nutrient deficiency diseases (e.g. marasmus, kwashiorkor, famine)
- Diabetes: dietary adaptations required
- Coronary heart disease: effects of too much saturated fat intake
- Dental caries: good dental care in relation to diet
- Excess salt consumption: effects upon blood pressure
- Bowel disorders related to too much / little NS
- Micro-nutrient deficiencies:

Vitamin A (retinol) – Night blindness / blindness / dry skin and mucous membranes/ reduce resistance to disease / growth of children retarded

Vitamin D (cholecalciferol) – Reduced absorption of calcium and phosphorus leading to weakened bones and teeth: rickets (in children), osteomalacia (in adults) / retarded growth of children

Thiamin (Vitamin B1) – Depression / irritability / difficulty in concentrating / defective memory / anxiety / retarded growth in children / beri-beri (exhaustion, weight loss, weakness in limbs)

Riboflavin (Vitamin B2) – failure to grow / skin lesions / dermatitis / conjunctivitis / swollen tongue / sore lips and mouth

Nicotinic acid – pellagra (dermatitis, dementia and diarrhoea)

Vitamin B 12 (Cobalamin) – a type of anaemia

Vitamin C (ascorbic acid) – connective tissue not made / walls of blood vessels weaken and break / general weakness / irritability / pain in muscles and joints / weight loss / fatigue / gums bleed / teeth loosen / scurvy / cuts and wounds fail to heal properly / anaemia because iron is not absorbed properly without Vitamin C

Calcium – children's bones and teeth are not mineralised properly / legs may bow (as for rickets and osteomalacia) / muscles and nerves do not function correctly leading to tetany (convulsions)

Iron – haemoglobin not made properly, leading to fatigue and weakness and in severe cases, anaemia / general health declines

Sodium, Chlorine and Potassium – muscle cramps

Fluoride – tooth decay can increase

Iodine – reduction in thyroxine produced by the thyroid gland leading to goitre / metabolism slows down and the gland swells up

Criteria for marks awarded	Mark Range
Candidate shows only a basic and somewhat superficial understanding of diet related illness and is not able to provide an accurate account of deficiency diseases.	0 – 3
A reasonable attempt. The candidate has a good understanding of diet related illness and is able to cover the most important points. The response is largely well explained, though there may be areas of weakness in terms of knowledge and understanding of deficiencies.	4 – 7
A full and well explained response. The candidate covers the question thoroughly, displaying a sound knowledge and understanding of diet related illness. The candidate may include topical information and is likely to make links between different concepts. Excellent knowledge and understanding of deficiency diseases.	8 - 10

(10 marks)

Q2

'Despite a diet stuffed with cream, butter, cheese and meat, just 10% of French adults are obese, compared with 22% in the UK and 33% in the USA. A recent survey conducted by the French government's committee for Health education found that 76% of French people eat meals they have prepared at home, eating at the family table. Eating in France is seen as a social activity, with several small courses and plenty of time taken between courses. In the UK, by contrast, we eat more pre-prepared foods and ready meals; we eat fast food; we have single large meals and family members will eat different foods at different times'.

(Adapted from 'The Observer', November 2004: 'French women don't get fat'.)

03 Using your own knowledge and the article above, discuss the view that there is an unhealthy attitude to food and nutrition in the United Kingdom.

Any well argued and justified point will be rewarded. To gain marks the candidate will need to analyse the information in the article and use this to explain the context and then develop it. Candidates will be expected to draw upon their own experiences and marks will be awarded for relevant discussion beyond the immediate context. Candidates may choose to dispute the information given in the article and will be credited for each relevant and justified point made.

Criteria for marks awarded	Mark Range
Candidate shows only a basic and somewhat superficial understanding of the context and makes obvious and sometimes unsubstantiated or inaccurate comments. There is little evidence of creative thought or well expressed personal opinion in the response. Candidates express straightforward ideas clearly, if not always fluently. Arguments stray from the point on occasion or may be weakly presented.	0 – 9
A reasonable attempt. The candidate has a good understanding of the context and is able to identify the most important points. There is evidence that the candidate has analysed the information effectively and is able to make informed responses. The response may omit some relevant points and may also lack depth and detail however. Candidates express straightforward ideas clearly, if not always fluently. Arguments stray from the point on occasion or may be weakly presented.	10 - 19
A full and well explained response. The candidate covers the question thoroughly, displaying a sound knowledge and understanding of the context. It is evident that the candidate has analysed the article thoroughly and has responded in an articulate manner, providing topical information and counter-argument appropriately. Candidate has expressed complex ideas extremely clearly and fluently. Sentences and paragraphs follow on from one another smoothly and logically. Arguments are relevant and well structured. There are few, if any, errors of grammar, punctuation and spelling.	20 - 28

(28 marks)

Q3 Food products which contain fat are at risk of spoilage through rancidity.**04 What is the difference between oxidative and hydrolytic rancidity?**

Rancidity is a chemical change in fats and oils brought about by either oxidation or hydrolysis. It leads to the production of odours and flavours, caused by aldehydes and ketones as the fat deteriorates.

Hydrolytic Rancidity – fats in the presence of water break down to release fatty acids from the glycerol in their constituent triglycerides. The process is accelerated by lipases (lipolytic enzymes) and micro-organisms (moulds especially).

Oxidative Rancidity – this occurs in unsaturated fats and oils and starts adjacent to the double bonds. The reaction is initiated by the presence of metals (copper and iron), ultra-violet light and high temperatures. Free radicals, which are highly reactive, are involved in the reactions.

Criteria for marks awarded	Mark Range
Candidate shows only a basic understanding of rancidity and is unable to describe the differences.	0 – 1
A good attempt. The candidate has some understanding of the differences. There may be inaccuracies in the response however.	2 – 3
A full and well explained response. The candidate covers the question thoroughly, displaying a sound understanding of rancidity.	4

(4 marks)

05 How can manufacturers prevent rancidity from occurring in the production and storage of food products?

Any creditworthy comment will be considered, for example:

- by using antioxidants, which absorb oxygen or stop the development of free radicals and the complex reactions in oxidative rancidity
- to prevent hydrolytic rancidity fats should be heat treated to kill any micro-organisms and inactivate any enzymes present
- to prevent oxidative rancidity (the most common type) the stored fat should be kept away from heat sources, light (particularly UV light) and traces of metals e.g. copper and iron.
- oils should be stored in glass lined containers or plastic as iron vessels will initiate oxidative rancidity
- fat should be kept cool and free from air (oxygen).

Criteria for marks awarded	Mark Range
Candidate shows only a basic knowledge of how to prevent rancidity. The response contains little or no reasoning.	0 - 2
A good attempt. The candidate is able to suggest some methods, but may have difficulty in explaining the underlying scientific principles.	3 - 4
A full and well explained response. The candidate is able to provide detail, demonstrating a sound understanding of the scientific principles and the initiators which cause rancidity.	5 - 6

(6 marks)

06 Describe the different molecular structures of each of the following.

Candidates should be rewarded for accurate diagrammatic representation of the molecular structure of the fats. Candidates can respond by diagrams or by a written answer.

monounsaturated fats

Monounsaturated fats – these contain one double bond e.g. oleic acid

polyunsaturated fats

Polyunsaturated fats – contain more than one double bond e.g. linoleic acid

saturated fats

Saturated fats – the hydrocarbon chain is saturated with hydrogen. There are no double bonds

trans fats

Trans fats – the arrangement of atoms at the double bond can be either *cis* or *trans*: *cis* fatty acids have the two hydrogen atoms on the same side, *trans* fatty acids have the hydrogen atoms on geometrically opposite sides of the double bond.

Criteria for marks awarded	Mark Range
Candidate shows only a basic understanding of the differences in molecular structure and may not be able to fully answer the question.	0 – 1
A good attempt. The candidate has some understanding of the molecular structure and may support the answer with diagrams. There may be inaccuracies in the response however.	2
A full and well explained response. The candidate covers the question thoroughly, displaying a sound understanding of the molecular structures. Accurate diagrammatic representation, if included.	3

Plus one overall mark for competent use of appropriate technical language and of spelling, punctuation and grammar.

(4 x 3 marks)

(13 marks)

07 Consider how manufacturers could adapt products which contain fat to make them more acceptable to the health conscious consumer.

Any well reasoned and appropriate response will be credited, for example:

- by changing the method of cooking, e.g. 'dry' frying, steaming
- by using monounsaturated fats such as olive oil instead of saturated or polyunsaturated fats
- by trimming off fat e.g. in meat
- by ensuring that animals for slaughter are allowed to exercise to prevent large fat deposits building up
- by using other ingredients for flavour, colour and texture – mimicking the organoleptic qualities of fat
- by using fat replacers, based upon starches
- by reducing the amount of fat used in products
- by developing more effective ways of draining off excess fat after frying has taken place

Criteria for marks awarded	Mark Range
No response worthy of credit.	0
Candidate has made an attempt to answer the question, giving some relevant points which could have been developed further.	1 - 2
A good attempt. The candidate has provided a range of possible methods with some clear explanation. The response may lack in depth and detail however.	3 - 4
A full and well explained response. The candidate covers the question thoroughly, producing some good ideas, some of which may be original or ingenious.	5

(5 marks)

SECTION 2: Processes and Manufacture**Q4 Manufacturers wish to develop a cheese and broccoli soup.****08 Describe four different ways in which the product could be thickened.**

1. By using a starch-based thickening agent such as cornflour, wheat flour. Modified starch, potato flour, rice flour, gram flour etc.
2. By pureeing all the ingredients, releasing the starch from the vegetable matter
3. By adding sufficient cheese to coagulate and thicken the soup
4. By adding milk, cream, soya products or yoghurt to the soup
5. By adding potato, rice or pasta

Criteria for marks awarded	Mark Range
Candidate is able to provide up to four methods, but the response lacks depth and detail.	0 – 1
A good attempt. The candidate is able to describe four methods, which are appropriate.	2 – 3
A full and well explained response. The candidate covers the question thoroughly, providing four appropriate methods with clear justification.	4

(4 marks)

09 Explain the term 'gelatinisation'.

Gelatinisation is achieved when a suspension of starch in water is heated. The water penetrates the outer layers of the granules and they begin to swell. The temperature range for this is usually between 60-80°C. The granules swell until the volume is as much as five times the original. The mixture becomes increasingly viscous. At 80°C the starch granules break up and the endosperm becomes dispersed throughout the water. The long chain molecules begin to unfold and the viscosity increases (thickens), forming a sol. On cooling a network is formed, with the water enclosed, which produces a gel. The whole process is known as 'gelatinisation' of starch.

Criteria for marks awarded	Mark Range
Candidate shows only a basic understanding of gelatinisation. The explanation lacks detail and may be confused.	0 – 1
A good attempt. The candidate has a reasonable understanding of the term. There may be inaccuracies or details missing in the response however.	2 - 3
A full and well explained response. The candidate covers the question thoroughly, displaying a sound understanding of gelatinisation.	4

(4 marks)

10 How can manufacturers ensure that the thickened soup does not undergo retrogradation once it is packaged and stored?

Retrogradation is the term used for a change which takes place once a gel is formed. The proportion of *amylose* in the starch affects the gelling properties. Amylose aids gelling because the molecules are spiral shaped and form a network in which water is trapped. If a rigid gel is required, high amylose starches are used. However, when foods are cooked and thawed or prepared for long-term storage, such as in cartons or cans, there is a risk of the amylose gel retrograding. When this happens, the amylose molecules unwind and the gel becomes opaque and a pulpy sponge. High amylopectin starches (e.g. waxy corn starch) are used by manufacturers to produce a strong gel that will not retrograde easily. Alternatively they may use a chemically *modified starch*.

Criteria for marks awarded	Mark Range
Candidate shows only a basic understanding of retrogradation. The explanation lacks detail and may be confused.	0 – 1
A good attempt. The candidate has a reasonable understanding of the term. There may be inaccuracies or details missing in the response however.	2 - 3
A full and well explained response. The candidate covers the question thoroughly, displaying a sound understanding of retrogradation.	4

(4 marks)

11 The manufacturers need to analyse the sensory attributes of the soup. How can they ensure that a 'fair test' is carried out?

Candidates are expected to describe in some detail the principles underlying 'fair testing'. They may make reference to the following:

- ensuring that the team are well trained and well briefed
- that the results are recorded accurately, free from the influence of other testers, using straightforward response sheets
- an atmosphere free from other smells
- an environment controlled by lighting and temperature
- individual booths to reduce influence from other testers
- that any bias is removed e.g. in ensuring that the samples are presented to the tasters in the same manner – on or in identical sized and shaped plain containers
- a small number of samples presented at any one time
- coded samples with random numbers
- correct serving temperatures for the food samples
- drinking water or eating a plain cracker biscuit between samples to clear the mouth.

Any other creditworthy response will be credited.

Criteria for marks awarded	Mark Range
Candidate shows only a basic understanding of 'fair testing'. The explanation lacks detail and may be confused.	0 – 2
A good attempt. The candidate has a reasonable understanding of the term and makes several relevant points with justification. There may be inaccuracies or details missing in the response however.	3 - 4
A full and well explained response. The candidate covers the question thoroughly, displaying a sound understanding of 'fair testing'.	5 - 6

(6 marks)

- 12 Consider the ways in which a manufacturer could produce a soup product so that it does not contain physical, chemical or microbiological contamination.**

Candidates will be credited for any control steps relevant to **physical, chemical or microbiological** contamination:

Physical:

- Visual checks
- Sieves, strainers and machines designed to separate particles
- Metal detectors
- Sensors
- Staff dress and standards of hygiene, e.g. hair coverings, protective clothing, gloves
- Regular maintenance of machinery (to minimise nuts, bolts etc falling off)

Chemical

- Storing chemicals e.g. cleaning materials, away from food and production lines
- Labelling cleaning materials carefully and training staff in using them safely
- Ensuring that chemicals used for cleaning are non-toxic and thoroughly rinsed away before production begins
- Making use of high pressure hoses and scalding water to clean instead of using chemicals
- To avoid cleaning with chemicals whilst production is in progress

Microbiological

- To ensure that products are fresh and from a reputable supplier before they enter the factory
- To store perishable foods at the correct temperature (0-5°C / -18°C and below for frozen foods)
- To maintain the cold chain for high risk foods
- To ensure that all areas which food comes into contact with are clean and disinfected
- To take swabs periodically to test for pathogenic bacteria
- To randomly test food samples for evidence of microbiological growth and to record the results
- To ensure that all staff are free of contagious illness and are trained in the highest levels of hygienic practices
- To date stamp all products providing clear storage and reheating instructions and use-by dates

Criteria for marks awarded	Mark Range
Candidate shows only a basic understanding of quality control. The explanation lacks detail and may confuse physical, chemical and microbiological contamination. Candidates express straightforward ideas clearly, if not always fluently. Arguments stray from the point on occasion or may be weakly presented.	0 – 3
A good attempt. The candidate has a reasonable understanding of quality control and can easily distinguish between the three types. There may be inaccuracies or details missing in the response however. Candidates express moderately complex ideas clearly and with reasonable fluency, through well linked sentences and paragraphs. Arguments are generally relevant and well structured. There may be occasional errors of grammar, punctuation and spelling.	4 – 6
A full and well explained response. The candidate covers the question thoroughly, displaying a sound understanding of quality control in relation to physical, chemical and microbiological contaminants. Candidate has expressed complex ideas extremely clearly and fluently. Sentences and paragraphs follow on from one another smoothly and logically. Arguments are relevant and well structured. There are few, if any, errors of grammar, punctuation and spelling.	7 – 10

(10 marks)

Q5 Describe the physical, nutritional and sensory effects upon milk of each of the following methods of preservation.

13 Pasteurisation

- Little change to organoleptic qualities. This is often considered to be 'ordinary' milk which people are most accustomed to
- Pasteurisation takes milk to 72°C for 15 seconds – not long enough or at a high enough temperature to have any significant effect upon nutritional value, flavour, colour or taste
- Up to about 10% of the thiamine and vitamin B12 is lost and 25% of the vitamin C

14 UHT (ultra high temperature / ultra heat treatment)

- The milk is heated to an 'ultra high' temperature of 132°C for 1 second which means that the milk proteins are partially 'cooked' and the lactose is partially caramelised. This affects the flavour of the milk, making it slightly 'cooked' in flavour, but as the process is so quick, the flavour changes are not so obvious as they are in sterilised milk.
- UHT milk is homogenised, so it may appear very slightly thicker or more creamy because the fat globules are evenly distributed throughout the milk.
- Water soluble vitamins B and C may be slightly affected by this process as they are unstable at high temperatures, but the holding time at 132°C is so short that the vitamin content will not be significantly reduced by this process. The nutritive value is similar to that of pasteurised milk

15 spray drying

- Skimmed milk is usually used for this process so the milk will have reduced amounts of fat and fat soluble vitamins
- The milk is sprayed into a hot-air chamber at a temperature to prevent the milk proteins from coagulating. This prevents the milk from having a cooked flavour. Water is rapidly lost from the droplets of milk by evaporation
- The spray dried milk forms a fine powder which can be reconstituted into whole milk by the addition of water. It does not form a perfect solution however, more a suspension, which gives the reconstituted milk a somewhat powdery, bitty texture. Spray dried milk is more soluble however than roller dried milk.
- Dried milk always appears 'thinner' when added to drinks such as tea, but little difference can be found when it is used in the making of custards, sauces etc.

16 evaporation

- The milk is homogenised and sterilised in the can, concentrated to about twice the density of the original milk
- It has lost about 60% of its vitamin C and 40% of the thiamine.
- Other nutrients are concentrated due to the loss of moisture
- It has a pronounced flavour and a distinctive tan colour due to the reaction between the lactose and proteins that takes place when the milk is sterilised in the can

Criteria for marks awarded	Mark Range
Candidate shows only a basic understanding of the method of preservation. The explanation lacks detail and may be confused.	0 – 1
A good attempt. The candidate has a reasonable understanding of the method. There may be inaccuracies or details missing in the response however.	2 - 3
A full and well explained response. The candidate covers the question thoroughly, displaying a sound understanding of the method and its effects upon physical, nutritional and sensory qualities of milk.	4

(4 x 4 marks)

(16 marks)

- 17 There is some concern that intensive farming methods, such as milk production, are ethically wrong. Using examples, discuss whether or not you agree with intensive farming methods for food production.**

Candidates will be credited for any relevant point and explanation/justification of that point. They should use examples to explain or illustrate their answer.

Criteria for marks awarded	Mark Range
Candidate shows only a basic and somewhat superficial understanding of the topic and makes obvious and sometimes unsubstantiated or inaccurate comments. There is little evidence of creative thought or well expressed personal opinion in the response. Sentences and paragraphs may not always be well connected. Arguments may stray from the point or be weakly presented. There will be some errors of grammar, punctuation and spelling.	0 – 3
A reasonable attempt. The candidate has a good understanding of the topic and is able to identify the most important points. There is evidence that the candidate has read around the subject and is able to make informed responses. The response may omit some relevant points and may also lack depth and detail however. Candidates express moderately complex ideas clearly and with reasonable fluency, through well linked sentences and paragraphs. Arguments are generally relevant and well structured. There may be occasional errors of grammar, punctuation and spelling.	4 - 7
A full and well explained response. The candidate covers the question thoroughly, displaying a sound knowledge and understanding of the topic. It is evident that the candidate is well informed and has responded in an articulate manner, providing topical information and counter-argument appropriately. Candidate has expressed complex ideas extremely clearly and fluently. Sentences and paragraphs follow on from one another smoothly and logically. Arguments are relevant and well structured. There are few, if any, errors of grammar, punctuation and spelling.	8 - 12

(12 marks)

Q6 Consider each of the following novel foods, explaining their characteristics and possible health benefits to the consumer.

18 products made from plant sterols and stanols

Plant *sterols* are found naturally in small quantities in many fruits, vegetables, nuts, seeds, cereals, legumes and vegetable oils. Plant *stanols* occur in even smaller quantities in many of the same sources. They both structurally resemble cholesterol (which is a sterol itself, though from an animal source). It is essential for life, but blood cholesterol, particularly low-density lipoprotein (LDL) cholesterol, should be controlled to minimise the risk of CHD. Excess can be oxidised to form a plaque that can build up on artery walls, restricting blood flow and elevating blood pressure. This could lead to heart attack or stroke.

Plant sterols and stanols if eaten in large enough amounts can serve to reduce the LDL levels in the blood. They are modified structurally and added to fat-containing foods without losing their effectiveness in reducing cholesterol. They have been found to inhibit the absorption of cholesterol in the small intestine by up to 50% which can in turn reduce blood cholesterol by up to 14%. They do not affect the HDL cholesterol. Products on sale include fatty spreads such as 'Benecol' and 'Flora Pro-Active'.

19 pro-biotic yoghurt products

These yoghurt products contain the 'friendly bacteria' (including *Lactobacillus acidophilus* and *Lactobacillus bifidus*). Yoghurts known as 'live' can have very low levels of these particular bacteria as they can easily be destroyed by heat and light. The pro-biotics must be carefully manufactured and stored in refrigerated conditions.

Pre-biotics are food products known as '*oligosaccharides*' a source of soluble fibre which stimulates the growth of the healthy *bifidobacteria* (e.g. Jerusalem artichokes, onions and chicory). These are often taken following a course of antibiotics to encourage the 'friendly bacteria' to grow again by providing a source of food for them to feed on.

Pro-biotic yoghurt products are reputed to help the gut to remain healthy. The bacteria break up gas formations, they consume less desirable bacteria and in general are purported to aid digestion and keep the gut healthy. Products on the market include such brands as 'Actimel' and 'Yakult'.

20 myco-proteins

These proteins were researched as a 'new' food in the 1960's by Rank Hovis McDougall. They were looking for a new food to help address a potential world food shortage envisaged at that time. The fungus *Fusarium graminearum* (a mycoprotein or fungal protein) was found to be safe for human consumption and experiments were carried out to see whether it could be produced via fermentation technology in large enough quantities and cheaply enough to be commercially viable. The first Quorn product (a savoury pie) was produced in the late 1980's, created by Marlow Foods.

Quorn is made by mixing the myco-protein with egg albumen and flavours (as Quorn has little flavour itself) and is processed to the desired texture.

Quorn is relatively high in protein (12.2%) and fibre (5% - higher than in most fresh vegetables), and low in total and saturated fat (2.9% and 0.6% respectively). The protein has High Biological Value – close to the ideal amino acid combination. There is no methionine or cysteine however in Quorn. It contains most of the B vitamins with the exception of B12.

It is a good vegetarian food, though not suitable for vegans. It is good for people on a low fat diet and is a good source of fibre.

Criteria for marks awarded	Mark Range
Candidate shows only a basic understanding of the method of the novel food. The explanation lacks detail and may be confused.	0 – 1
A good attempt. The candidate has a reasonable understanding of the novel food, characteristics and possible health benefits. There may be inaccuracies or details missing in the response however.	2 - 3
A full and well explained response. The candidate covers the question thoroughly, displaying a sound understanding of the novel food and is able to explain its characteristics and possible health benefits.	4 - 5

(3 x 5 marks)

(15 marks)

21 Explain why packaging is important to the food industry.

Candidates will be rewarded for any relevant and well explained response. The main points will centre around the 'Five P's':

1. to protect the food during transit and storage
2. to prevent tampering with the food
3. to preserve the food e.g. cans, MAP, vacuum packs etc.
4. to promote the product to the consumer
5. to present information to the consumer

The food industry has a responsibility to its consumers to ensure that the food they purchase is 'fit for purpose' and packaging is perhaps the main method they have of ensuring this. They also have to promote their products to entice consumers into buying them. Packaging bears the labelling and this is a vital communication link between consumer and manufacturer. Without packaging the manufacturer would find it very hard to protect itself and consumers would have very little come-back on the manufacturer if things went wrong.

Criteria for marks awarded	Mark Range
Candidate shows only a basic understanding of the importance of packaging. The explanation lacks detail and may be confused.	0 – 2
A good attempt. The candidate has a reasonable understanding of the importance of packaging. There may be inaccuracies or details missing in the response however and the candidate may not always make reference to the food industry.	3 - 4
A full and well explained response. The candidate covers the question thoroughly, displaying a sound understanding of the importance of packaging to the food industry. Some original thought evident.	5 - 6

(6 marks)

22 Describe ways in which manufacturers can reduce the volume of materials they use for packaging food products in order to save wastage of resources.

Any reasonable and relevant answer is acceptable. To gain high marks the candidate must provide a clear explanation of their thinking. Creative and original ideas are to be rewarded. Ideas could include any of the following and other ideas besides:

- to cut down the volume of packaging: i.e. to reduce net sizes, to minimise the number of separate layers of packaging
- to use recycled packaging material for transit packaging
- to develop new and imaginative ways of packaging foods, which protect and preserve, but which are economical
- to give consumers incentives, such as money back for the return of bottles, plastic food trays which cannot go into the recycle bin
- to look at the recycling of 'thinner' plastic packaging materials
- to make recycling bins more readily available and accessible
- to make recycling symbols more recognisable
- to make more food packaging materials biodegradable
- to sell larger quantities of food in family sized packs

Criteria for marks awarded	Mark Range
Candidate shows only a basic understanding of waste reduction. The explanation lacks detail and may be confused. Weak use of appropriate technical language and of spelling, punctuation and grammar.	0 – 2
A good attempt. The candidate has a reasonable understanding of waste reduction. There may be inaccuracies or details missing in the response however. Competent use of appropriate technical language and of spelling, punctuation and grammar.	3 - 4
A full and well explained response. The candidate covers the question thoroughly, displaying a sound understanding waste reduction. Original and creative thought is evident. Excellent use of appropriate technical language and of spelling, punctuation and grammar.	5 - 7

(7 marks)