

# GCE 2004

## *June Series*



# Mark Scheme

## Design and Technology: Food Technology *(Subject Code FTY6)*

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*The answers given in the following mark schemes are neither exhaustive nor exclusive. Candidates whose answers do not appear directly on the mark scheme, but who have demonstrated knowledge, understanding, or skills relevant to the question will receive appropriate credit for their answers.*

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*Dr Michael Cresswell Director General*

**ASSESSMENT and QUALIFICATIONS ALLIANCE**

**General Certificate of Education**

June Examination 2004

DESIGN AND TECHNOLOGY (ADVANCED)

FOOD TECHNOLOGY UNIT 6 (FTY6)

**Section A: Materials and Components**

Question 1

- (a) Candidates will be expected to understand that ‘micro-nutrients’ is a collective term referring to Vitamins and Minerals. Credit will be given to answers which give any relevant, but general points about micro-nutrients, such as the fact that the body requires a range of mineral elements which can be absorbed from food; that some minerals are only required in trace amounts and that excessive amounts can cause food poisoning; that vitamins are organic substances which are required in small quantities and cannot be synthesised by the body (with the exception of vitamin D); that vitamins can be sub-divided into two groups: fat soluble and water soluble.

Criteria for marks awarded	Mark range
A weak answer. The candidate shows a very basic understanding of the term and may only be able to make one point.	<b>0-1</b>
A good understanding of the term. Several points made. There may be inaccuracies.	<b>2-3</b>
A comprehensive answer. The candidate demonstrates a detailed understanding of the term.	<b>4</b>

- (b) Candidates will be given credit for any relevant point which is made in describing the source, function and dietary deficiency of the **two** chosen micro-nutrients.

N.B. Marks awarded below are for **one** micro-nutrient.

Criteria for marks awarded	Mark range
A weak answer. The candidate may demonstrate insufficient knowledge of the chosen micro-nutrient and may be confused.	<b>0-2</b>
A good attempt. The candidate shows a fair knowledge of the chosen micro-nutrient and provides several relevant facts. There may be omissions.	<b>3-4</b>
A full and detailed answer demonstrating a very good knowledge of the micro-nutrient selected.	<b>5-6</b>

- (c) In food processing, loss of iron occurs as it dissolves into the processing water which may be discarded. Finely chopped fruit and vegetables present a large surface area to water and therefore many substances readily dissolve into the water. Cutting fresh fruit and vegetables releases enzymes which catalyses the oxidation of ascorbic acid. In certain vegetables, iron accumulates near to the peel and therefore peeling will remove iron. The use of bicarbonate of soda (sodium hydrogen carbonate) to prevent chlorophyll loss, but not for vitamin C, which is stable in acidic conditions. During cooking and processing, losses of up to 75% of ascorbic acid may occur. Short processes involving small volumes of water incur the smallest losses. Vitamin C can be added to blanching water prior to freezing or canning, but these processes, together with dehydration, account for significant vitamin C losses. Thiamin (vitamin B1) behaves similarly to vitamin C. Serious losses of thiamin occur when sulphur dioxide or sulphites are used as preservatives, e.g. in frozen chips where sulphur compounds are used to prevent browning. Vitamin B2 (Riboflavin) is less water - soluble and can withstand heat but decomposes under alkaline conditions, as does Vitamin B6 (Pyridoxine), which is susceptible to heat and light. Milling wheat and cereals such as rice causes the loss of vitamins B1 and B2. Losses of the fat-soluble vitamins are very low in food processing, though the use of 'low-fat' foods reduces the presence of these vitamins.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
The candidate shows very little knowledge and understanding of the effects of food processing on the micro-nutrients. Some basic points may be made with little explanation.	<b>0-3</b>
The candidate makes a good attempt to describe the adverse effects. There may be omissions and some confusion in the answer.	<b>4-6</b>
A very good answer which covers most, if not all the possible factors. Points made are well described and explained.	<b>7-8</b>

Question 2

- (a) Amylose is the simplest form of starch. It is a chain of  $\alpha$ -glucose units. Amylopectin is composed of many shorter chains of  $\alpha$ -glucose with many branches.

Amylose is made up of about 300 glucose units joined together, but the number varies enormously, (can range from 50 to 500). The  $\alpha$ -glucose units are joined by  $\alpha$ , 1-4 glycosidic links to make a chain. The glucose units tends to spiral. There are six glucose units per turn of the spiral.

Amylopectin is more complex in structure and is much larger than amylose. It often has several thousand glucose unit components. The glucose units are linked to form short branching chains which are again in a spiral form. This gives amylopectin a ‘tree-like’ appearance. The branches in the chain are produced by  $\alpha$  1-6 glycosidic links.

A glycosidic link is when the two glucoses condense together and water is eliminated. The remaining oxygen atoms form a bridge between the two glucoses. This bridge is called a glycosidic link.

Criteria for marks awarded	Mark range
The candidate may not be able to describe the structural form adequately. The answer and any illustrations may show little or no understanding.	0-2
The candidate has made a good attempt at describing and/or illustrating the structural form. There may be some omissions or confusion, but the main aspects are covered.	3-4
A good answer which explains clearly how amylose or amylopectin is formed. Illustrations are clear and accurate.	5-6

- (b) Plant starch is always accompanied by alpha and beta amylases, known as diastase. This enzyme system works rapidly to break down starch into maltose and some dextrans.

If a starch is used to thicken a canned soup, for example, it must be heated to ensure that no amylase activity is present. If it is then the starch-thickened soup will suddenly turn back to the viscosity of water as the enzyme breaks down the starch to dextrans.

Criteria for marks awarded	Mark range
A weak answer which demonstrates no knowledge or understanding.	0-2
A good attempt. The candidate describes some relevant factors.	3-4
A full answer which includes all or most points.	5-6

- (c) (i) The proportion of starch and water present will affect the gel consistency. The more starch the stronger the gel. Candidates may mention the difference between a pouring, coating and binding sauce. Credit will be given for this.
- (ii) The proportion of amylose in the starch affects the gel because amylose aids gelling and therefore high amylose starches are used where a rigid gel is needed.
- The presence of acid e.g. lemon juice hydrolyses starch and reduces gel strength forming a viscous paste. An example of this is the lemon sauce in a lemon meringue pie.
  - The presence of sugar reduces gel strength because sugar competes with the starch for water, thus reducing the viscosity of the gel.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
A weak answer which covers some points, possibly superficially. Some of the sections may not have been covered.	<b>0-4</b>
A good answer. Candidates will have covered many aspects. There may be omissions. All sections must be covered to achieve marks in this section.	<b>5-8</b>
A full and detailed answer. All sections are covered. The candidate demonstrates a sound knowledge and understanding of the question.	<b>9-12</b>

**Section B: Design and Market Influences****Question 3**

- (a) Evaluating existing products is often used by product development teams to find new ideas for new products. Competitors' products provide a useful source of information for manufacturers, who carry out 'in-house-testing' on them. Such tests will include sensory evaluation and identification of ingredients. The team will then go on to assess other useful information such as portion size, packaging, value for money and so on.

Candidates will be credited for each relevant and justified point made.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
Some basic points are made but the answer lacks depth and detail. The candidate fails to expand upon ideas or justify points made.	<b>0-3</b>
Some good points made, but the candidate sometimes fail to justify or expand upon them. The answer may lack depth or originality and may be confused.	<b>4-6</b>
A full and detailed answer with some original thought evident. The candidate has a sound understanding of the topic.	<b>7-8</b>

- (b) To achieve full marks, candidates must describe in detail the need to set up a 'fair test'. Types of test to include: preference or acceptance tests; difference tests; paired comparison tests; grading tests. They must describe systematically the procedures that are to be followed, stating what is to be tested and how the results are to be recorded and analysed and how the team are to be trained. They should consider the type(s) of products to be purchased for the study. Examples to support the answer will be credited.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
The candidate has made an attempt at answering the question but the answer is basic, showing a poor knowledge and understanding of the topic.	<b>0-3</b>
The candidate has made a good attempt at answering the question. Not all of the relevant information has been included and some aspects may need further explanation.	<b>4-6</b>
The candidate displays a sound understanding of product analysis and describes in detail how the test is to be set up and carried out.	<b>7-8</b>

- (c) There are roughly three areas in the food production process where costs are incurred, and these are ultimately passed onto the consumer. These are:
- AGRICULTURE (expenses associated with farm businesses, such as wages, buildings, machinery etc, the cost of harvesting and the cost of transport);
- FOOD PROCESSING (factory business expenses such as premises, wages, market research etc; costs of machinery, costs of packaging);
- FOOD RETAILING (retail business expenses such as rent, clerical support, shop fittings etc; costs of display, costs of sales including tills, staff etc).

In order to ensure that a profit is made, costs need to be worked out at each stage in great detail. All costs incurred are compiled and compared against sales figures, which need to be thoroughly monitored. In this way each business can calculate the cost per unit of production, whether it be by the kilo (as in sugar produced) or by the packet produced (as in biscuits).

Costs can be FIXED or VARIABLE. Fixed costs do not change readily. They include such things as wages, heating, lighting, insurance etc. Variable costs vary according to the level of output, e.g. cost of ingredients, running costs of machinery, packaging costs etc. As the number of units of food being processed increases, the fixed costs become less significant in relation to the variable costs. This ‘economy of scale’ can be further enhanced by negotiating a discount for bulk purchasing.

BREAK-EVEN POINT occurs when all the production costs are equal to the revenue gained from the sale of units of the product. In order to make a profit, a selling price must be established such that all the costs of production are exceeded by the revenue from the number of units sold. Break-even point for production will vary according to the price charged per unit.

Costs associated with new product launches must take into account changes to manufacturing equipment and processes, new technology requirements, packaging etc. On top of this marketing costs have to be considered and then the need to monitor the effectiveness of this through consumer research. Consumer reaction to pricing is an important consideration. Low price does not always make high sales.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
The candidate has made an attempt at answering the question but the answer is basic, showing a poor knowledge and understanding of the topic.	<b>0-3</b>
The candidate has made a good attempt at answering the question. Not all of the relevant information has been included and some aspects may need further explanation.	<b>4-6</b>
The candidate displays a sound understanding of cost calculation and describes in the factors that must be taken into account. A full answer	<b>7-8</b>



Question 4

Candidates will be expected to cover a broad range of concepts, which could include any of the following:

Extensive consumer surveys to assess needs and wants.

Changing eating trends and consumer expectations.

Consumer desires associated with health, simplification of domestic tasks, instant gratification, time conservation, youth and looking good, value for money, fun and casual lifestyle.

Special dietary needs, allergies etc.

New and novel foods created through advances in Biotechnology and Microbiology.

Modern methods of food preservation.

Use of food additives.

Novel packaging ideas.

Intensive advertising and marketing techniques.

Pester power of children.

Job opportunities in the food industry for graduates: new ideas from up-and-coming professionals.

Supermarket competition and rivalry.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
The candidate has made an attempt at answering the question but the answer is basic, showing a poor knowledge and understanding of the topic. Examples given lack justification and originality.	<b>0-8</b>
The candidate has made a good attempt at answering the question. A reasonable number of points are made though some aspects may need further explanation. Some original thoughts expressed and relevant examples given.	<b>9-16</b>
A well written and full answer which covers many different points and demonstrates original thought. The essay is well supported with examples. Good use of topical issues.	<b>17-24</b>

**Section C: Processes and Manufacture**Question 5**PRODUCT FORMULATION**

Reliable product development team able to produce quality design ideas and take account of consumer preferences for foods that have specific health benefits.

Use of a reputable supplier with good trace ability to the source.

Good Quality Assurance system in place.

Use of additives which comply with European regulations.

**MANUFACTURING PRACTICES**

Well trained staff who are vigilant

Well maintained machinery

Effective HACCP system in place

Effective use of CAD and CAM

Metal detectors on production line/ microbial/ visual checks etc.

**PACKAGING AND LABELLING**

Packaging materials selected carefully to ensure they are functional and effective, but non-toxic.

They should comply with European regulations.

Quantities of packaging materials used are minimal, to reduce waste.

Packaging materials selected should be suitable for recycling or easy disposal.

Label design should be clear and easy to read and should not only contain information required by law but additional useful information for the consumer.

**TRANSPORTATION AND STORAGE**

Safe temperatures should be maintain. Regular monitoring and checks should take place.

Quality checks should have back-up systems.

Storage containers, displays and transport vehicles should be well maintained and alarmed in case temperature levels fall below safe levels.

Effective transportation, packaging systems to prevent damage and cross-contamination.

<b>Criteria for marks awarded</b>	<b>Mark range</b>
The candidate has made an attempt at answering the question but the answer is basic, showing a limited knowledge and understanding of the topic. Points made lack justification and explanation	<b>0-2</b>
The candidate has made a good attempt at answering the question. Not all of the relevant issues have been included and some aspects may need further explanation or justification.	<b>3-4</b>
The candidate displays a sound understanding of health and safety issues and describes systematically the critical areas and ways in which they can be monitored. Some original thought is evident, demonstrates original thought. The essay is well supported with examples. Good use of topical issues.	<b>5-6</b>

(4 x 6 marks)

Question 6

- (a) Yakult and Actimel are a ‘pro-biotic’ foods, which are rich in bacteria, known to have positive health attributes. These types of yoghurt are known as ‘bio’ yoghurts and claim health advantages as they are living cultures, including the organism *Bifidobacterium bifidum*, which helps stomach problems by colonizing the gut. The organism also produces a acetic acid as a flavouring agent and ferments a milder, creamier product. It has been well documented that people living in countries whose national diet has included ‘live’ yoghurt, have lower incidences of gut-related disease. ‘Bio’ products, researchers believe, can assist people who suffer from excessive production of flatulence.

Criteria for marks awarded	Mark range
The candidate has made an attempt at answering the question but the answer is basic, showing a limited knowledge and understanding of the topic.	<b>0-3</b>
The candidate has made a good attempt at answering the question Not all of the relevant issues have been included and some aspects may need further explanation.	<b>4-6</b>
The candidate displays a sound understanding of ‘Bio’ products and describes in detail their positive attributes	<b>7-8</b>

- (b) Reference should be made to many of the major food-poisoning bacteria and the foods which they are most likely to affect.

Social and economic implications can include any of the following:

- Changing lifestyles and eating patterns at home (use of the microwave /freezer, chilled meals and the need to follow storage/ cooking instructions carefully).
- Increase in availability of fast food (higher disposable incomes, employment of low-paid and sometimes poorly trained casual staff to cook and serve food).
- The desire for readily available foods at a reasonable price and implications associated with intensive farming (e.g. chickens/ eggs/ beef/ tomatoes/ apples etc.)
- The desire for blemish- free products and implications associated with the use of pesticides /G.M. etc.
- The desire for profitability and intense competition coming especially from the large supermarket chains and the knock-on effect upon suppliers. Implications for third world producers.

Criteria for marks awarded	Mark range
The candidate has made an attempt at answering the question but the answer is basic, showing a limited knowledge and understanding of the topic. The answer may lack specific information about food-poisoning bacteria and high risk foods	<b>0-5</b>
The candidate has made a good attempt at answering the question Not all of the relevant information has been included, especially about food poisoning bacteria and some aspects may need further explanation. Some good points about social and economic implications made, though this section may lack originality.	<b>6-11</b>
The candidate displays a sound understanding of food-poisoning bacteria and high risk foods and describes in detail relevant social and economic implications. Some well argued points made, displaying original thought.	<b>12-16</b>

**Total marks on Paper 100**