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Examiners' Report

June 2011

GCE Design & Technology: Food
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Introduction

This paper deals with a full range of food materials, their characteristics and properties, and the way in which they are handled, stored and processed. In addition, the module includes a significant amount of nutrition. Food products are constantly being developed or modified, it is, therefore, appropriate that aspects of product development, food innovation, and relevant business activities are included. As many of these subject areas are large it is important, as always, that candidates read the questions carefully. Many candidates waste valuable time in producing answers, which may contain factually correct material, but are not relevant to the question asked. Candidates should not react to single 'key words' but read the whole question carefully. Food processing and the manufacture of finished products invariably involves a sequence of operations. Candidates who achieve good marks tend to reproduce these sequences in the correct order and by so doing do not miss out any relevant points. Candidates are not penalised for listing stages in the wrong order, neither is there any negative marking for giving wrong information, but they tend to miss points. Most of the questions deal with commercial systems producing food and using raw materials on a large scale, only occasionally the kitchen approach to food production will be relevant. The underlying principles may be similar and the candidate should adapt them to the question. As in all technical subjects accuracy will gain the best marks.

Question 1 (a)

This question is requesting knowledge of individual proteins in eggs. This was poorly answered and was apparently not covered by most candidates.

Question 1 (b)

This question deals with the functions of egg yolk, and not egg white or the egg as a whole.

(b) Give **three** characteristics of egg yolk that make it useful as a food ingredient.

(3)

- 1 co-agulates - it sets in food to make food firm -
e.g. Quiche.
- 2 Binding - it is useful for binding food together
such as mince in burgers.
- 3 Colour - the bright colour effects the overall
finish of foods.



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Examiner Comments

This answer includes three acceptable responses; the most significant property being that of the emulsifying capability of egg yolk.

Question 1 (c)

Many candidates misunderstood this question and talked about the egg as a whole and the shell as a barrier. The response which would gain most marks included details of the high pH (alkaline) which is not liked by bacteria and the various anti-microbial systems in the egg white. In particular the action of the enzyme, lysozyme which splits bacterial cells. There is often confusion between bacteria and enzymes.

(c) Explain how the white of an egg inhibits the growth of bacteria.

(3)

The white of an egg contains anti-bacterial properties which inhibit growth of bacteria if it manages to get through the pores in the shell and the shell membranes. It also has a high alkaline pH, which bacteria do not like. Sometimes the pH can be as high as 9.0. Although egg whites are high in water, they do not contain much food for bacteria to grow on.

(Total for Question 1 = 8 marks)

* ① Egg yolks are good for enriching products as they are high in protein. They also add flavour and colour. They are used to enrich ~~the~~ products such as pastries.



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This answer is clear on the aspect of high pH, but more detail could have been given on anti-microbial properties. A borderline mark was given for this.

Question 2 (a)

All candidates gave sugar beet and sugar cane as their answers, rarer sources such as sugar maple were not mentioned.

Question 2 (b)

Most candidates knew the origin of sugar in part 2a and there was a basic understanding of the process of obtaining sugar from sugar cane. In a number of cases very specific detail was given on sugar beet processing including details of individual stages such as purification. Possibly this was a result of a candidate visit to a sugar beet factory.

(b) Outline the production of sugar from a natural source.

(6)

The sugar cane is crushed ~~broken~~ /cracked open and sprayed with water, the sucrose then dissolves into the water. It is heated to purify the mixture with lime + CO₂. The water is evaporated off. The mixture is then centrifuged to extract the sugar. 96% of the sucrose is sent to Britain to be refined. It is centrifuged once again and washed to remove any molasses. It is then purified again with lime + CO₂ ^{to remove impurities} and charcoal in a vacuum evaporation system evaporates the water to form crystals. ~~The~~ The crystals are suspended in a syrup like solution and are separated by centrifugation. The damp sugar is then dried. Charcoal



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Examiner Comments

Most aspects are included in this answer.



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Examiner Tip

Try to produce a sequence of operations so nothing then is left out.

Question 3 (a)

There are a considerable number of diet-related diseases. Candidates generally had no difficulty with this, although there were some general health examples.

3 (a) Name **two** diet-related diseases. (2)

1 Diabetes

2 Obesity



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Probably the most common answers given. A number of candidates actually indicated it was type 2 diabetes.

Question 3 (b)

In comparing the nature of two special diets most candidates knew the significant aspects, e.g. a lactose-intolerant diet must be free of dairy products because of the lactose coming from milk.

(b) Outline the key elements of **two** named special diets. (4)

Special diet 1 vegetarians

Key element These are people that choose to eat a diet free from meat/fish and therefore gain protein from meat substitutes or LBR proteins. This could be due to lifestyle change or medical reasons.

Special diet 2 Lactose intolerant

Key element These are people that are allergic to lactose containing foods including milk, cheese, egg etc (dairy products) so therefore have a dairy free diet. There are products that are dairy free for less.

(c) Discuss the effects that the 'food miles' issue may have on food production and ²⁰⁰⁰...



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A typical response but commercial or 'trend' diets were not acceptable, e.g. Atkin's diet.

Question 3 (c)

Candidates were well acquainted with the arguments surrounding the issue of food miles. A number tended to extend their discussion to 'fairtrade'.

(c) Discuss the effects that the 'food miles' issue may have on food production and consumption.

(4)

Food miles is the distance food is traveled, its not sustainable for food ~~wites~~ to travel a long distance as this is costly and contributes to global warming. To reduce food miles and increase sustainability people are more likely to buy local food and inject money into the local economy. This is usually within a 30 mile radius. As consumers can grow their own fruit and veg. With people buying local food, less food will need to be imported from over seas.

(Total for Question 3 = 10 marks)



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Examiner Comments

A reasonable answer, but there is no mention of seasonal availability or to overseas producers, particularly in developing countries.

Question 4 (a)

This question was very specific to the making of malt from barley as a preliminary process to beer-making. It did not ask for details of the actual beer process.

4 (a) Explain how the malting process is carried out as a preliminary process in beer-making.

(4)

Barley (malt) is encouraged to sprout in warm moist conditions. When germination occurs this activates the enzymes alpha and beta amylases to break down starch into maltose. When enough maltose is produced the malt is extracted for beer making.



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This answer covers the main issues of malting, and is accurate in details. Full marks would have been awarded if final details of the process such as drying and grinding had been included.



ResultsPlus Examiner Tip

As always make sure to answer the particular aspect required, here it is malting not beer-making.

Question 4 (b)

Most candidates understood the basics of making different wines, with a number giving actual names of grapes (although no marks were allowed for this).

(b) Compare the basic principles of producing red wine with those of producing white wine.

(6)

Red wine is produced from red grapes with the skins on and it is left to ferment for a long time. White wine is made from just the flesh of both red and white grapes, they have to be pressed (traditionally by foot) in order to extract the juice. Then it is left to ferment but for a shorter time than the red wine must be left for longer the higher alcohol percentage you want. When red ferments, it develops its deep red colour and a strong flavour due to the skin.



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Examiner Comments

Most of the main points are included but more detail on the use of yeast starter cultures would have achieved full marks.

Question 5 (a)

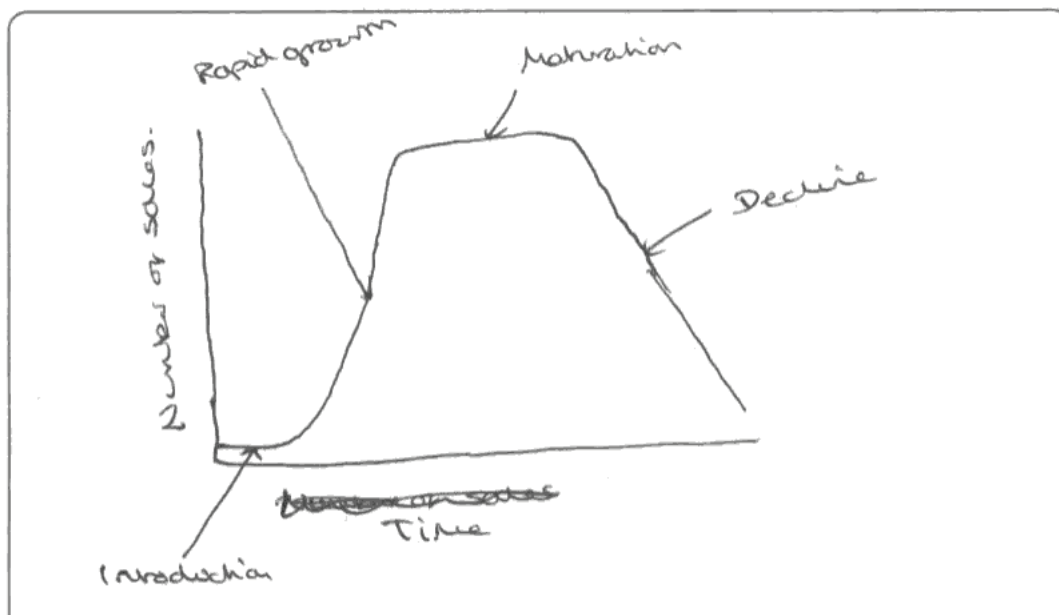
This is the standard pattern for the life of a product. Some candidates included details of actual development and some used different names for the stages.

- 5 (a) State, using notes and/or sketches, the **four** main stages in a food product's life-cycle.

Growth Maturity decline

(4)

Introduction - the product is first bought out in Supermarkets/shops, + consumers know little about the new product
Growth: More consumers became familiar with the product and sales increase due to good advertisement skills e.g. pop up, telly
Maturity: The product has reached top sales and has become a top brand in Supermarkets.
Decline: The decline of sales due to competition or other brands.



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Examiner Comments

All aspects are covered.



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Examiner Tip

A clear diagram where appropriate is an easy way to gain good marks.

Question 5 (b)

There are many factors which can influence the development of new products. These factors range from technical aspects, to environmental issues, marketing and lifestyles. New technologies also lead to new products, but candidates should not be misled by concentrating on other innovations included in the same section of the specification such as 'encapsulation'.

Question 6 (a)

Pasteurisation was originally developed to eliminate the bacterium in milk (*Mycobacterium tuberculosis*) which causes TB. However, the heat process will also kill other organisms (but not all) and so reduces spoilage and extends shelf-life. Good answers clearly indicated these aspects.

6 (a) Explain why it is advisable to pasteurise cows' milk for human consumption.

(4)

Pasteurising cows milk kills food poisoning bacteria. This means that diseases that the cows milk may carry are removed for example TB which has caused food scares. Therefore it is advisable to pasteurise the milk at 72°C for 15 seconds to destroy this food poisoning bacteria so that it is safe for consumption. It does not cause any significant vitamin loss or changes to flavour.



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Examiner Comments

This answer is rather basic, although TB is mentioned it does confuse it with food poisoning. There is no mention of shelf-life.

Question 6 (b)

A surprising number of candidates were confused with cheese-making in part or completely. Many used the term whey instead of buttermilk.

Question 6 (c)

Skimmed milk is made by centrifuging whole milk to separate the cream, which is lighter than the water phase. Special separators are used for this. Many candidates mentioned a preliminary process of homogenisation which breaks down the fat in cream into small stable particles which are then very resistant to separation, so this is the opposite of what is required in producing skimmed milk. Allowing to stand is too slow and commercially not viable.

(c) Describe the process of producing skimmed milk from whole milk.

(4)

Whole milk like when it is homogenised, is sprayed through a fine nozzle into a centrifugal separator, where the dense milk is moved to the outside of the separator leaving the lighter fat in the middle allowing skimmed milk to be drained off. Although this drains off the vast majority of fat there is still usually 0.1%, much lower compared to 3.2% of whole milk.

(Total for Question 6 = 12 marks)



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Examiner Comments

Here is an example of homogenisation incorrectly included, centrifugation is correct.

Question 7

This question was about the macro-nutrients; carbohydrates, fats and proteins. A number of candidates were confused with micro-nutrients such as calcium or iron, and some mentioned water. However, most candidates gained most marks but with few gaining total marks.

*7 Discuss the functions of the **three** macro-nutrients in the human diet.

Macro-nutrient 1 Protein:

It is advised to have between 45g to 55g of protein in an average daily diet. ^{There} Main sources are meat, pulses, fish, poultry, beans + peas, etc. The main function of protein is for growth and repair - this is of muscle tissue to all cells in the body. (Including tissue).

A back up role of protein is to provide the body with last resort energy. It is able to be used in an aerobic energy system, but only when the protein is extremely stored. A deficiency in protein would cause poor muscle structure or a poor immune system.

Macro-nutrient 2 Carbohydrates:

It is advised for a woman to eat 230g of carbs per day. And it is also advised for men to eat 300g of carbs per day.

The main sources of carbs are pasta, potatoes, bread etc, or anything with a source of starch in it. The main

function of carbohydrate is to provide energy in both aerobic or anaerobic systems. It does this by breaking down into glucose, so that the glucose can then be ~~g~~ turned into pyruvate, through glycolysis, which allows ATP to ~~be~~ be broken down & used for energy.

Carbohydrates are ~~turned~~ turned into fat if not used - as the amount you eat must be the amount you use for energy. (Metabolic rate affects this) - it is then stored in the adipose tissue: Obesity, can be caused.

Macro-nutrient 3 Fats:

It is advised for ~~men~~ men to eat 95g of fat (including 30g of ~~unsaturated~~ saturated fat) or women to eat 70g of fat (including 20g of unsaturated fat). The main sources of fats are dairy products, meat, cakes, biscuits, etc.

There are many functions in the body for fat. Firstly, it is used to transport the fat soluble vitamins (D, E, A etc) around the body for use. It is also used for warmth, as it is highly ~~heat~~ insulative.

Fat also helps to ~~prevent~~ protect vital organs, and acts as a guard for them - e.g. fat around your heart. Too much fat can cause blood clots, leading to coronary heart disease. It can also lead to obesity.

Fat, on a positive, is a very good energy source - providing 130 ATP per molecule - in ~~an~~ the aerobic energy system - mainly through ~~the~~ beta-oxidation.



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Examiner Comments

The first and last part of this answer were good. However, although there is a lot of correct information in part two on carbohydrates it is not relevant.

Paper Summary

Candidates are advised to always read the question carefully and not to react to single key words. Ensure as much technical accuracy as possible but avoid irrelevant detail. For food processes, remember to describe equipment or processes in sufficient detail, 'invented' processes will not be of any value. Try to produce a sequence of operations, which will aid the memory, in order to obtain the top marks.

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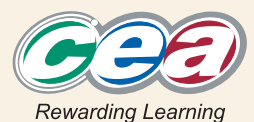
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