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Examiners' Report
June 2010

GCE Design and Technology 6FT03 01

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Introduction

Unit 3 now includes Food Commodities, Nutrition and Product Development. For the first time there is a significant amount of nutrition which has been welcomed by many centres. However, although many centres are well experienced on aspects of Food Commodities responses on Nutrition varied from very good to poor. Interpretation of the specification caused some problems, for example, although encapsulation is in the same section as biotechnology it is a separate subject and should not be used in answering a question on biotechnology.

Summary of candidate responses:

Q1a – most gave the correct answers.

1b – very few gained maximum marks. Question often misinterpreted. Structure of meat was often given rather than the behaviour of live muscle during contraction.

1c – many knew this well and were able to gain full marks. Some strayed from the question and discussed the factors that affect glycogen levels.

Q2 – GENERAL COMMENT – digestion is new to syllabus. Some candidates showed little knowledge of the topic, but in contrast otheres knew the topic thoroughly.

2a – many didn't know these.

2b – very poorly answered. Rarely gave 2 marks. No one knew bile aided absorption of fat soluble vitamins.

2c – many did know this. Common errors – many put peptase or peptin as an enzyme; some said Amylase breaks down carbohydrate rather than specifying starch.

Q3a – Many gained full marks. Topic had been taught very well.

3b – many knew this very well too. However many candidates referred too much to bananas and some mentioned storage in the home.

Q4a – difficult to gain 4 marks here as most could not provide enough detail on their chosen example. Some gave more than one example (stated in question). Most common error was to discuss modified starches.

4b – not all candidates realised this required reasons for and against so could only gain a maximum of 3 marks. Key words in stem – "primary food production" sometimes were ignored.

Q5a – Some explained these terms very accurately. Others made "educated" guesses which often gave them half marks. Common error was that RNI gave you the quantity of nutrients found in foods rather than an indicator of the amounts people need. GDAs were better known but failing to refer to the amounts needed for a "healthy diet" restricted the marks that could be given. Candidates need to learn these terms better.

5b – surprising number of very basic mistakes made in this question. Many referred to Vitamin B, without a suffix number, so gained no marks. Other basic mistake was to give minerals rather than vitamins. In addition many candidates gave sources and deficiency consequences – not asked for. However, some candidates have learned this very well and many gained all 6 marks.

Q6a - many knew all 3. others gave casein and whey proteins.

6b – this was well answered by many who gained all 9 marks. Many started by explaining how milk is pasteurised which was not relevant. Others became sidetracked and discussed bacteriophages attacking the starter culture. Some discussed cheese production briefly and then moved onto the addition of moulds or the different types of cheese.

Q7 - candidates often had high level knowledge of this topic but their responses could have been better structured. Whilst it was fine that the chemical process were sometimes integrated into the description of the processes the order of the response was often muddled and incorrect. That said, many candidates scored very highly and showed excellent knowledge of this topic. Many were able to explain the chemical processes that occurred in detail. Others gave brief, muddled and inaccurate information such as that CO2 is added to the dough. Relevant temperatures and times were seldom given. Many discussed the Chorleywood method or compared this to the traditional method.

GENERAL OBSERVATIONS

Centres are covering commodities very well and probably benefiting from the number of previous exam questions they have access to. The standard of knowledge of newer topics such as digestion and nutrition was more variable. Many candidates used extra sheets which in many cases were not needed and rarely gained further marks.

Question 1a

Only two proteins are acceptable, actin and myosin.

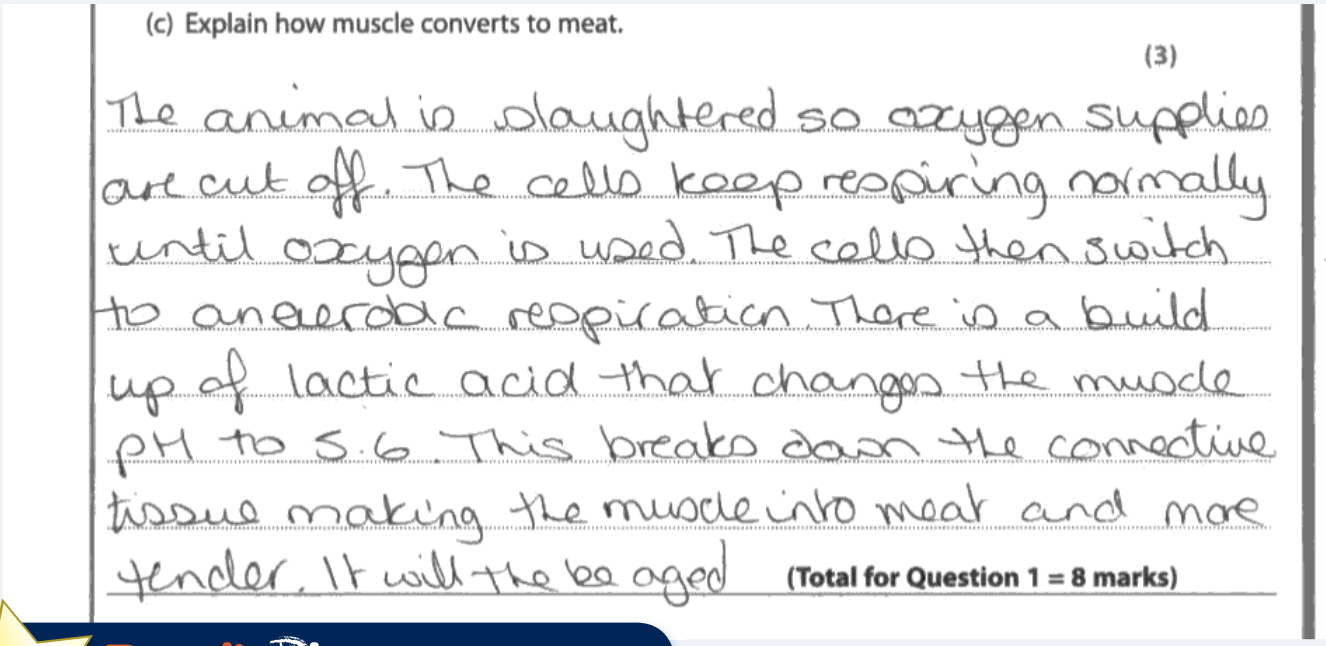
Question 1b

This question is about muscle contraction in live muscle, and not after death.

Question 1c

Question 1

(c) This question requested details of the changes which occur when meat is formed from muscle. The answer requires mention of rigor mortis, conversion of glycogen to lactic acid and consequential fall in pH. The final part is the action of enzymes breaking down the big protein molecules. Unfortunately, many candidates confused this question with 1(b) which dealt only with muscle contraction.



(c) Explain how muscle converts to meat.

(3)

The animal is slaughtered so oxygen supplies are cut off. The cells keep respiring normally until oxygen is used. The cells then switch to anaerobic respiration. There is a build up of lactic acid that changes the muscle pH to 5.6. This breaks down the connective tissue making the muscle into meat and more tender. It will then be aged

(Total for Question 1 = 8 marks)

ResultsPlus
Examiner Comments

The candidate has a good understanding of the topic and only lost a mark due to omitting the action of enzymes

ResultsPlus
Examiner Tip

This is initially contraction of muscle but then a fall in pH and rigor mortis setting in to be followed by softening due to enzymes

Question 2a

Only two enzymes are asked for, rennin and pepsin.

Question 2b

The role of bile in digestion and its emulsification of fat is the basis of this question.

Question 2c

The enzyme systems operating in the small intestine and the substances on which they act is requested in this question. Only enzymes included in the specification are included in the mark scheme.

Question 3a

This question deals with physical and chemical changes which occur in fruit in general during the ripening process.

Question 3b

The aim of this question was a discussion of the factors and conditions which affect fruit during storage, and should not include in the answer changes which during the fruit during storage e.g. colour changes or softening. These changes were required for 3(a)

(b) Discuss the conditions which affect fruit during long-term storage.

(6)

- Critical temperature of which each fruits is specific, if this is exceeded senerosce and decay will occur
- Atmospheric concentration. Increased CO_2 levels will prevent fruit becoming too ripe by decreasing respiration. The level of O_2 should be decreased else respiration will continue to occur.
- Presence of ethylene will increase the ripening process
- If ripe fruit is stored with unripe fruit, the ethylene from the ripe fruit will increase ripening and cause the underipe fruit to decay quickly
- A coating on fruit slows down ripening, extending storage life by creating a semi-permeable barrier.

(Total for Question 3 = 10 marks)

ResultsPlus

Examiner Comments

The candidate has mentioned the effect of gases and ethylene but has not distinguished between climacteric and non-climacteric fruits. Therefore, the answer only meets about half the points.

ResultsPlus

Examiner Tip

Ensure the right approach is taken in this type of question, i.e. here the conditions in storage.

Question 4a

This question requests the explanation of the role of all aspects of biotechnology in influencing the development of new ingredients and products. It does not require details of the actual biotechnology processes.

Question 4b

This is an evaluation question and therefore requires the case 'for' and 'against' the role of genetic modification in primary food production. This refers, therefore, to the growing and production of food, and again details of the actual process are not required.

(b) Evaluate the roles of genetic modification in primary food production.

(6)

One of the main roles of genetic modification is to increase crop yields. Plants can be grown from organisms which grow in vast amounts, which means more profit can be made by the increase in stock available. Furthermore, it allows for pesticide resistance in plants, which are common problems in rural areas of production. As a result, more money is saved from the non-use of chemicals. Also, it allows for foods to be grown in alien climates such as during the winter, which increases primary food production as much production takes place in various times of the year e.g. in the Summer.

(Total for Question 4 = 10 marks)

ResultsPlus
Examiner Comments

The candidate gave a good answer 'for' Gm but nothing against, and so only achieved half marks.

ResultsPlus
Examiner Tip

In an evaluate question ensure you include items 'for' and 'against'.

Question 5a

This question on nutrition requires details of nutrient intake and guidelines. These must be clearly distinguished.

Question 5b

Three vitamins were requested and details of their function in the body. Actual names or letters of the vitamin were equally allowed e.g. ascorbic acid or vitamin C.

Question 6a

The three main proteins of milk were required. Although there are several caseins only one mark was allowed, the other two being lactoglobulin and lactalbumin.

Question 6b

In describing the cheese process the basic process of a typical cheese such as cheddar would be an ideal answer. Although, candidates are not penalised for having stages in the process in the wrong order the best answers were from candidates who covered the logical flow of events to produce a ripened finished cheese.

(b) Describe the cheese production process.

(9)

Cheese is produced by first pasteurising the milk to remove any bacteria that may be present. The milk is then put into a huge vat to which rennet is added, this is what causes milk to coagulate and as a result, solid lumps of curd begin to form. The milk is left for a long period of time whilst the acid levels increase which cause the lactoglobulin and lactalbumin to clot as well. Eventually, a solid chunk of curd is left as well as a thick liquid which is the whey proteins (lactalbumin and lactoglobulin). The curd is then cut into smaller blocks and pressed which removes any whey proteins that remain in the curd, the whey proteins are drained away. The milk milk the can then be cut or put in moulds to achieve the required shape, the blocks of cheese are then piled up and left to mature for a minimum of 3 months, during this time the bacteria levels increase which converts any remaining lactose to lactic acid which gives the desired flavour of cheese. Some

manufacturers also introduce moulds onto the cheese for example while making blue cheese, small quantities of the bacteria are on wooden wires which are then put on the cheese, this is what creates the "veins" on the outer surface of the cheese. Usually the longer the cheese is left to mature, the stronger the smell and flavour. Some are left to mature for years before the characteristic is reached.

(Total for Question 6 = 12 marks)

ResultsPlus
Examiner Comments

The candidate understands a lot of the process but misses out some essential details like use of starter cultures.

ResultsPlus
Examiner Tip

Try to work through a sequence of operations in order to provide the maximum detail.

Question 7

This question is about making bread and the processes and chemical changes involved. It is not about milling and preparing wheat to produce flour which is suitable for making flour. The mark scheme is equally divided between the processes involved and details of the necessary chemical changes.

***7** Describe the processes and chemical changes which occur when wheat flour is made into bread.

(12)

To make bread ~~with~~ wheat flour is combined with yeast, salt, warm water and a small percentage of fat. The wheat flour is the 'bulk' ingredient and contains gluten needed for the structure and overall textural properties of the bread. The yeast is

needed to produce CO_2 and increase the volume of the dough, it is activated by the warm water. If the water is too hot the yeast will be killed but too cold and it won't be activated. Salt is added for flavour and is involved with chemical reactions during the cooking process. The fat works with the flour to shorten the gluten strands, this helps them slide over each other and create a complicated structure. Once the ingredients are combined the mixture is kneaded, this is essential to develop the gluten network and produce the overall structure of the bread. The dough is then shaped and left to prove in a warm oven. During proving the yeast is activated to the maximum. This causes the production of carbon dioxide which causes the bread to expand and increase with volume. Due to instability of the loaf, if the bread touches anything during proving the air bubbles will burst and the bread will collapse. After proving the bread is cooked in an oven. The temperature is extremely high so the yeast is inhibited and ultimately killed, therefore carbon dioxide production is ceased. The protein in the form of gluten within the wheat flour coagulates, sets and cooks. This causes the creation of the honeycomb structure

which can clearly be seen in cooked bread. The colour of bread changes from the white of the wheat flour to a golden brown colour, this is due to dextrisation. This is ultimately the change in coloured compounds which occurs during the cooking process. Some breads are glazed during the cooking process in order to make them look more attractive for the consumer. During the process of making bread s-s bonds are created between the protein strands this helps to stablize and give the bread it's overall shape. Sometimes in industry the chorlyll wood process and active daugh development are used. This produces a daugh and ultimately bread in a much shorter period of time. Kneading is performed mechanically and it reduces the need for a second proving period. During the period of baking the bread can become caramalised, this generally only occurs in sweet bread where sugar has been added. A caramel occurs when the sugar (sucrose) is boiled leading to a golden brown colour occurring. This is similar to the Maillard reaction.

ResultsPlus
Examiner Comments

The candidate understands the basics but this is not in sufficient detail, especially in chemical aspects to deserve a higher mark.

*7 Describe the processes and chemical changes which occur when wheat flour is made into bread.

(12)

The basic ingredients in bread making are flour (strong), yeast, water and salt. When warm water is added to the flour, the two proteins in the flour, glutenin and gliadin, react to form gluten, which is responsible for the expansion and elasticity of the bread dough. As the dough is mixed and kneaded (either manually or mechanically), the gluten network is gradually developed, stretching the gluten chains and enabling the dough to become elastic but at the same time, have the extensibility. As the dough is left to rise, the yeasts become activated and fermentation takes place. The amylose in the flour is attacked by amylase (an enzyme) to maltose, which provides a source of energy for the yeast to use to enable fermentation. Usually, a small amount of sugar is added in the mixture to provide a quick energy source for the yeast. During the fermentation process, the sugars are converted into carbon dioxide (CO_2) and alcohol, giving the characteristic alcohol smell during fermentation. The 'proving' process is also of great importance to the gluten development. The addition of salt strengthens the gluten chains. During this stage, there is an

important change to the bonds between the gluten chain. The sulphydryl groups (-SH) in the cysteine amino acids unit is oxidised to di-sulphide bridges (-S) which enables for the gluten network to develop greatly, which is why yeast contains ascorbic acid (a reducing agent) which enables for these bond changes to take place.

When the dough is ready for baking, it firstly needs to be shaped. Often the dough is kneaded for a short period of time to enable the CO_2 to be removed from ~~this~~ within the gluten chains. During baking, enzyme activity and yeast activity increase, producing a bigger volume dough. However, the yeasts start to become inactivated above 45°C but amylase is more heated resistant and continue to breakdown the amylose until approximately 75°C - 90°C. As the temperature increases the proteins react with the sugars to produce brown pigments, known as the Maillard Reaction, giving the characteristic brown ~~flavour~~ colour and flavour often seen in bread once baked. Certain alcohols and esters form in the crust of the bread.

(Total for Question 7 = 12 marks)

TOTAL FOR PAPER = 70 MARKS

ResultsPlus
Examiner Comments

This is a well detailed and accurate answer.

ResultsPlus
Examiner Tip

Again, try to work through a sequence of operations and support details such as the chemical changes involved.

Candidates, as always, must read the question and ensure they answer it in the intended way and, at A2 level, do not digress into basic or not required detail. In longer questions, candidates who gave a sequence or flow of invidual operations scored significantly better as they were able to provide greater detail.

Grade Boundaries

Grade	Max. Mark	A*	A	B	C	D	E	N	U
Raw mark boundary	70	48	43	38	34	30	26	22	0
Uniform mark scale boundary	80	72	64	56	48	40	32	24	0

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