



## General Certificate of Education

# Home Economics

## *5561/6561 Unit 6 Food Science and Technology*

# Mark Scheme

## *2005 examination - June series*

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

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# Contents

## GCE Home Economics

Unit 6 Food Science and Technology .....	5
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## Food Science and Technology

HEC6

Each question carries 25 marks. Students answer two questions.

### Question 1

- (a) Protein average of 15% is on target (1)

Carbohydrate average should be 47% (1)

of dietary energy in a diet containing alcohol, therefore the average British diet is 5% below what is recommended (1)

or 50% (39% starch and 11% sugar) (1)

in a diet free from alcohol, therefore the av. British diet is 7% below what is recommended (1)

Total fat intake should be 33% of dietary energy (1)  
(no credit for discussing types of fatty acid)

Therefore the average British diet is 5% above what is suggested (1)  
Any 5 marks

(5 marks)

- (b) **Energy Balance** is one when the amount of food eaten matches energy output

Factors which influence it are:

- **Age** - children have a greater need to meet the demands of growth and increasing physical activity. Reduced need as one gets older - BMR slowing down and less physical activity.
- **Gender** - males generally have a larger body surface area than females and more lean body tissue which demands a higher energy intake.
- **Occupation and physical activity** - where there is increased physical exertion, e.g. farming, athletes, there is a greater demand for energy. Conversely sedentary occupation require less energy.
- **State of body/health** - in pregnancy, particularly in the last trimester there is an increased need for energy to meet the demands of the growing foetus and similarly when breastfeeding. In illness there is a reduced need for energy because of low levels of activity but increasing need during convalescence.

### Criteria bands

**Top band: 7-9 marks** The candidate will attempt to identify each of the 4 factors and discusses how they may influence an individual's energy requirements. Candidates at the lower end of this band may be able to manage to discuss 2/3 factors in detail

**Middle band: 4-6 marks** The candidate is able to identify up to 3 factors and discusses 1 or 2 in detail. An attempt may be made to mention the other factor.

**Bottom band: 1-3 marks** The candidate has minimal understanding of the factors which influence energy requirements of individuals. An attempt may be made to discuss one of the factors.

(10 marks)

(c)

Candidates should understand the principles of B.M.I and appreciate that the boy is obese.

The general advice should be as follows:

Reduce energy intake from food so that reserves of energy in body fat are used up

Increase physical activity

A day's meals which demonstrates the principles underlying healthy eating (low sodium options; increased intake of dietary fibre; high starch)

Candidates must also appreciate that the meals are for a 16 year old therefore his needs for rapid growth of body cells (protein), skeleton (calcium and vitamin D) and increased blood capacity (iron and vitamin C) must be met. B vitamins are important to ensure energy is released and for healthy nerves. Retinol is essential for growth, healthy mucous membranes and the production of rhodopsin.

Evidence of this level of understanding should be reflected in the menus created by the candidate.

#### **Criteria bands.**

**Top band 7-9 marks:** The candidate identifies and applies the principles for achieving weight loss effectively, i.e. reduced energy intake combined with exercise. Healthy eating guidelines are clearly demonstrated by the choice of foods and an appreciation of the nut. needs of 16 year olds is obvious.

**Middle band 4-6 marks:** The candidate demonstrates a good understanding of the principles of weight loss. The menu will reflect the candidates appreciation of the healthy eating goals and there may be some evidence of knowledge of some of the nut. needs of 16 year olds.

**Bottom band 1-3 marks:** The candidate has a minimal understanding of the principles of weight loss and healthy eating. There is little appreciation of the nut. needs of 16 year olds.

(10 marks)

#### **Question 2**

(a) Carbohydrates are divided into three main groups:  
**monosaccharides** (1) **C6 H12 O6** (1)

**disaccharides** (1) **C12 H22 O11** (1)

**polysaccharides** (1) **(C6 H10 O5)** (1)

(6 marks)

(b) Bread provides thiamine for energy release (1)  
starch for energy (1)

iron for the production of haemoglobin (1)

L.B.V. protein for growth (1)

calcium for strong bones (1)  
niacin for healthy nerves (energy release) (1)  
Nsp, if wholemeal 1 mark for healthy bowels (1)  
Has a good satiety value (1)  
Wide variety (with 2 examples) (1)  
Can be used in many different ways (2 examples) (1)  
Good flavour linked to dextrinisation (1)  
Any 7 marks

(7 marks)

- (c) Flour - high gluten (1)  
forms (rigid) framework (1)  
gluten stretches when (wet) (1)  
Gluten coagulates on heating (1)  
Small percentage of starch (1)  
broken down (by enzymes) (1)  
to produce glucose (1)  
which is fermented by the yeast (1)  
to produce CO<sub>2</sub> (1)  
Yeast plus any one of the following conditions (time, food, warmth, moisture, O<sub>2</sub> and correct pH) (1)  
Salt plus one function (strengthens gluten / controls action of yeast / develops flavour) (1)  
Liquid plus one function (provides soft texture, produces water vapour) (1)

(12 marks)

### Question 3

- (a) Less chance of developing high blood pressure/hypertension (1)  
which is associated with an increased risk of coronary heart disease (1)  
and stroke (1)  
Less of the burden for making individual cuts falls on the consumer (1)  
(70% of salt in diet comes from processed food) (4 marks)
- (b) All body fluids contain salt it - has an important function of maintaining fluid balance within the body (1)  
Needed for the transmission of nerve impulses (1)  
and muscle impulses (1)  
Needed for generating gradients across cells to enable the uptake of nutrients (1)  
Needed for the production of hydrochloric acid in (gastric juice) (1)  
Any 4 Marks (4 marks)
- (c) Colours (1)  
to make the food look attractive to boost colours already in food (1)  
e.g. caramel, beetroot red, tartrazine (1)  
Preservatives (1)  
to extend the shelf life of food/stop the growth of microbes (1)  
e.g. salt, sulphur dioxide (1)  
Sweeteners (1)  
intense (1)  
are 300 times sweeter than sugar, e.g. aspartame, saccharin (1)

bulk (1)  
such as sorbitol, mannitol (1)  
Emulsifiers and stabilisers (1)  
help to improve the consistency (1)  
e.g. lecithin, xanthum gum (1)  
Flavourings and Flavour enhancers (1)  
used to improve taste by adding/restoring (1)  
e.g. vanilla extract, herbs, spices, MSG (1)  
Antioxidants (1)  
to prevent fats combining with O<sub>2</sub> /rancidity (1)  
to slow down enzyme activity in fruit and vegetables, e.g. ascorbic acid/ sulphur dioxide,  
tocopherol (vitamin E) (1)  
Accept any 4 from the 6 examples given (12 marks)

- (d) Increasing numbers of children with allergies (1)  
hyperactivity (1)  
attention deficit disorder (1)  
Concerns about the health consequences of using synthetic additives (Sudan (1)  
Concerns about masking poor quality food (1)  
Concerns about the unnecessary use of sodium/sugar/and their derivatives (1)  
and the consequences for health, e.g. hypertension/dental caries/diabetes/some cancers  
(1)  
Any 5 Marks (5 marks)

#### Question 4

- (a) **Vegetarian diets include:**

**Vegan**

Lbv proteins through complementation. Relevant e.g. beans on toast. Use of meat analogues. Soya milks. Pulses, nuts and cereals.

Calcium from dried figs, currants, and raisins, pulses, cereals, nuts, bread, green vegetable, but must appreciate problems caused by phytic acid. Hard water.

Vitamin B12 - found almost exclusively in foods of animal origin. Marmite for vegans, otherwise supplements are necessary.

Vitamin D - fortified margarines and sunshine.

Iron - non-haem variety in watercress and green leafy vegetables (spinach), parsley, dried fruit, pulses, (soya), wholegrain cereals, white bread. Must appreciate difficulty in absorption because of phytic acid and oxalic acid. Need for Vitamin C to convert non haem iron into haem iron.

Energy - lots from starchy plants. Reduced intake from fats.

**Lacto-vegetarian**

Protein from milk and dairy products

Calcium from milk and dairy products

Vitamin B12 - from yeast extracts, e.g. Marmite

Vitamin D - lots of whole milk and dairy products

Iron - same as for vegans. None in dairy foods.

Energy - provided by fat in dairy foods such as cheese and milk. Lactose in milk.

Otherwise the same as for vegans.

**Lacto-ovo vegetarian**

H.B.V. protein from milk, cheese and eggs



Calcium from milk and dairy products  
Vitamin B12 from  
Vitamin D from whole milk and dairy products  
Iron - some from egg yolk, but most from plant foods  
Energy from fat in milk and dairy foods and egg yolk as well starch and sugar from plant foods.

(18 marks)

### Criteria Bands

**Top Band 13-18 marks:** The candidate demonstrates a high level of knowledge and understanding and has described the 3 types of vegetarian diets with considerable accuracy. An in depth discussion of how to provide the dietary components is produced. At the top end of this band, candidates may refer to problems associated with the absorption of some nutrients.

**Middle Band 7-12 marks:** The candidate has attempted to identify and describe at least 2 main types of vegetarian. A sound knowledge and understanding is demonstrated by the suggestions that are made for the provision of the nutrients identified in the question.

**Bottom Band 1-6 marks:** The candidate has a basic understanding of at least 2 of the types of vegetarian diets. An attempt has been made at suggesting ways in which some of the nutrients identified in the question can be supplied. The discussion may lose focus and become rather general.

(b) **Benefits**

Can be cheaper than buying meat

Better for long term health and the diet of vegans equates well to the recommendations of the COMA 41 Report - low fat, sodium and sugar; high nsp; high complex carbohydrates.

**Possible disadvantages**

Bulky and monotonous.

Lacto /lacto ovo vegetarians diets can be high in total fat intake and saturated fats, unless sensible alternatives are used.

Omnivores are at less risk of developing iron deficiency anaemia because of easy access to haem iron. (Difference between absorbency levels of haem and non haem iron should be explained.)

### Criteria Bands

**Top Band 4-7 marks:** The candidate will have an in depth knowledge and understanding of a wide range of benefits and some disadvantages of vegetarian diets. Nutritional knowledge will be accurate and detailed. At the lower end of this band candidates will demonstrate a good knowledge and understanding of the benefits.

**Bottom Band 1-3 marks:** Candidate demonstrates a basic level of understanding of the benefits of vegetarian diets. May only discuss either the benefits or the disadvantages.