

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
International General Certificate of Secondary Education

**MARK SCHEME for the October/November 2012 series**

**0648 FOOD AND NUTRITION**

**0648/13**

Paper 1 (Theory), maximum raw mark 100

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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## Section A

1 (a) carbohydrate – fat – protein

3 x 1 mark

[3]

(b) carbohydrate      4 kcal/16 kJ  
fat                      9 kcal/37 kJ  
protein                4 kcal/16 kJ

3 x 1 mark

[3]

(c) Energy balance

energy intake = energy output

or

number of kcal taken into the body = number of kcal used

1 well-explained statement = 1 mark

[1]

(d) Different individual energy requirements

age	young children require energy for growth
gender	men have larger overall body size – use more energy
activity	physical work/exercise requires more energy – sedentary workers require less energy than manual workers
health	more energy required to repair damages cells after accidents
pregnancy	energy required for growth of baby
lactation	energy for production of milk
weight reducing programmes	uses reserves of fat for energy – require less from food
body size	more surface area needs more energy – greater heat loss from surface – energy to maintain body temperature
climate	energy required to maintain body temperature in cold weather
BMR different for everyone	amount of energy required for breathing, heartbeat, blood circulation etc.

12 points: 2 points = 1 mark

[6]

(e) Too much energy-giving food is consumed

excess converted to fat – stored under skin – adipose tissue – or around internal organs – leading to obesity – CHD – tendency towards diabetes – lethargy – breathlessness – high blood pressure – strokes – low self-esteem – problems during surgery etc.

8 points: 2 points = 1 mark

[4]

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- 2 (a) Animal sources of iron  
liver / kidney  
red meat (or named example)  
corned beef  
eggs  
  
2 points = 1 mark [1]
- (b) Plant sources of iron  
cocoa / plain chocolate  
curry powder  
black treacle  
dried fruit (or named example)  
pulses  
soya beans  
green vegetables (or named example) etc.  
  
2 points = 1 mark [1]
- (c) Haemoglobin [1]
- (d) Function of haemoglobin  
picks up oxygen from lungs – becomes oxyhaemoglobin  
transports oxygen to cells – oxidises glucose – cell respiration  
energy released – leaving carbon dioxide and water  
  
4 points: 2 points = 1 mark [2]
- (e) Anaemia [1]
- (f) Symptoms of anaemia  
pale  
lethargic/tired  
weakness  
headaches  
dizziness  
  
4 points: 2 points = 1 mark [2]

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3 (a) Functions of vitamin C

clear skin / linings of digestive system / gums  
to make connective tissue / to bind cells together  
for production of blood / walls of blood vessels  
to help heal wounds  
growth  
to build strong teeth/bones  
assists vitamin E in preventing CHD  
anti-infective / prevents colds

(do not allow absorption of iron – given in question)

3 x 1 mark

[3]

(b) Sources of vitamin C

citrus fruit (or 1 named example)  
blackcurrants  
rose hips  
strawberries  
melon  
tomatoes  
kiwi fruit  
papaya  
green peppers  
green vegetables (or 1 named example)  
new potatoes etc.

2 examples – 1 point each: 2 points = 1 mark

[1]

(c) Deficiency disease

Scurvy

[1]

(d) Reason for a daily supply

Vitamin C cannot be stored in the body

or

Vitamin C is water soluble so is easily lost from the body

1 well-explained statement = 1 mark

[1]

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4 (a) Digestion in the small intestine

in the **duodenum** – trypsin – from pancreatic juice – converts protein to (peptones)/peptides/polypeptides  
 bile – stored in gall bladder – made by liver – emulsifies fat – breaks fat into small droplets  
 increases surface area  
 lipase – converts fats to glycerol and fatty acids  
 amylase – in pancreatic juice – converts starch to maltose

in the **ileum** – erepsin – from intestinal juice – converts (peptones)/peptides/polypeptides to amino-acids  
 lipase – completes breakdown of fat to glycerol and fatty acids  
 maltase – converts maltose to glucose  
 lactase – converts lactose to glucose and galactose  
 sucrase – converts sucrose to glucose and fructose

(At least **four** points from each part of the small intestine.)

12 points: 2 points = 1 mark

[6]

(b) Absorption in the small intestine

walls of ileum lined thousands of villi – finger-like projections  
 each villus is surrounded by a wall of single cells/walls of villi are 1 cell thick  
 nutrients pass through – to reach centre – where there is a lacteal – connected to the lymphatic system  
 lacteal surrounded by blood capillaries – connected to larger blood vessels  
 glucose – and amino-acids – water soluble vitamins and minerals – absorbed into blood capillaries – dissolve in blood – carried around the body  
 glycerol and fatty acids – recombine in cells in wall of ileum – absorbed into lacteal – mix with lymphatic fluid – pass around body in lymphatic system – join the blood circulation as insoluble fat – converted to soluble in the liver  
 fat-soluble vitamins absorbed with fats – and are taken to the liver

(Can credit information shown on a diagram)

6 points 2 points = 1 mark

[3]

[Section A Total: 40]

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## Section B

5 (a) The use of a refrigerator

keeps food longer – slows down rate of deterioration – reduces need for daily shopping – and some foods can be served chilled – e.g. cold desserts, salads etc. but food will still spoil  
 temperature 1–7 °C – ideally 4 °C – if lower than that, water will freeze – and spoil texture of food – if higher than that, will encourage bacterial growth  
 cover – to prevent cross-contamination – and surface of food drying – and smell of food being absorbed by other foods – e.g. fish, cheese  
 clean containers – so bacteria remaining in container do not pass to food  
 cool food before refrigerating – or will raise temperature in refrigerator – and encourage growth of bacteria  
 raw meat on bottom shelf – so juices do not drip onto cooked food – contain bacteria and will not be killed by heat if food is already cooked  
 check 'use by' date – refrigerators only slow down food spoilage  
 use food in rotation – oldest first so safest food kept till later  
 do not overload/overfill/over-pack – allow cold air to circulate – and maintain a suitable temperature  
 do not leave door open longer than necessary – cold air escapes – warmth encourages bacterial growth – more electricity needed to cool  
 follow instructions on packages – to keep food in safest condition  
 clean refrigerator regularly/wipe up spills – remove risk of bacterial growth  
 defrost regularly unless automatic defrost – remove build up of ice – and make refrigerator work more efficiently etc.

10 points: 2 points = 1 mark

[5]

(b) Different uses of fats and oils

spreading on bread – butter, margarine  
 frying – corn oil, sunflower seed oil – high flash point  
 sauce-making – margarine, butter  
 aeration – margarine traps air when creaming – cake-making and when rubbing in – in pastry-making – holds layers of pastry apart when rolling and folding – flaky pastry  
 shortening – crumbly texture of shortcrust pastry, rock buns etc.  
 for flavour – butter in rich cakes etc.  
 for colour – in pastry, sauces etc.  
 improve keeping quality – in rich cakes etc.  
 sealing – melted butter/margarine on pate to retain moisture  
 adds calories without adding bulk – fried food  
 dressings – French dressing – adds moisture – and gloss  
 forms an emulsion – mayonnaise  
 basting – adds moisture to meat cooked by dry heat/grilled/roasted  
 decorating – butter icing  
 makes foods easier to eat/lubricates – butter on toast  
 prevents sticking – oiled baking tins  
 glazes – melted butter on new potatoes, carrots etc.  
 storing/covering during storage to keep moist – olives etc.  
 may add nutrients – fat, vitamins A/D

10 points: 2 points = 1 mark

[5]

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(c) The advantages and disadvantages of steaming

**Advantages**

food not in contact with water – no loss of water soluble vitamins  
 easy to digest – light texture – suitable for convalescents/elderly  
 little attention required except to replenish water  
 food unlikely to overcook  
 can cook several dishes in different tiers  
 uses only one burner on stove – saves fuel  
 low heat required to maintain water temperature  
 can be carried out in pressure cooker – saves time  
 healthy method as no fat is used

**Disadvantages**

food takes a long time to cook – requires more use of fuel  
 heat destruction of vitamin C more likely to occur  
 kitchen likely to be filled with moisture  
 food does not develop colour – can be insipid – fish, puddings etc  
 food remains soft – no crisp/variety of texture

(at least 2 points from each area)

10 points: 2 points = 1 mark

[5]

6 (a) Reasons for serving sauces

add moisture	gravy, custard etc.
add nutrients	custard, chocolate sauce, cheese sauce etc.
add colour	jam sauce, chocolate sauce, parsley sauce etc.
add flavour	cheese sauce, mint sauce, apple sauce etc.
counteract richness	apple sauce with roast pork, orange sauce with duck etc.
add interest/variety	curry sauce etc.
add contrasting texture	bread sauce with roast poultry, parsley sauce with fried fish etc.
aids digestion	tartare sauce

4 reasons + 4 examples

8 points: 2 points = 1 mark

[4]

- (b) (i) melt fat – add flour – stir – with wooden spoon  
 broader base/does not conduct heat – fits corners of pan  
 over gentle heat – until sandy/crumbly – do not allow to brown  
 prevent burning of fat/flour – spoiling colour – and flavour  
 remove from heat – add milk – gradually – prevent lumps  
 flour does not gelatinise – stir all time – smooth liquid  
 return to heat – bring to boil – stir all the time – boil for 3 minutes  
 to cook starch – to prevent floury/raw flavour  
 starch gelatinises – should coat the back of wooden spoon – add cheese

8 points: 2 points = 1 mark

[4]

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(ii) Dishes which include cheese sauce

macaroni cheese  
lasagna  
cauliflower cheese  
pasta bake  
eggs/fish au gratin etc.

2 points = 1 mark

[1]

(c) Ways to reduce fat in cheese

Reduce margarine / use low fat spread  
use semi-skimmed / skimmed milk  
use less cheese  
choose cheese with a stronger flavour and use less  
use low fat cheese etc.

3 x 1 mark

[3]

(d) Reasons for lumps in sauce

milk added too quickly  
too much milk added at a time  
not stirred when milk added  
not stirred when boiling

3 x 1 mark

[3]

7 (a) The importance of food packaging

protects food from damage – during transport – and storage  
identifies product – gives information – advertises – may give nutritional information/educational  
eye-catching for consumer so manufacturer may sell more – allows stores to display goods in an attractive way  
saves time in shops – foods do not need to be wrapped – easy to carry  
attracts customers – prevents tampering – protects food from pests – preserves – food does not come into contact with bacteria – from hand/equipment/shelves etc. – prevents loss of moisture  
makes storage easier – rigid shapes can be stacked  
items contain a specific weight – sold at a set price  
foods can be put away after shopping in a shorter time etc.

10 points: 2 points = 1 mark

[5]



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(b) The information on food labels

some information is a legal requirement

name of product

description

name of manufacturer

address of manufacturer

ingredients

cooking instructions

storage instructions

serving suggestions/recipes

picture of product

weight

special claims

vegetarian society symbol

wheat ear symbol

recycle symbol

nutritional information

kilocalorie content

sugar content

fat content

salt content

additives identified

may include nuts

price

Halal information

use by / best before dates

portions provided

percentage of R.D.A. of certain nutrients

country of origin

so customer knows what is being bought  
further details e.g. tuna in brine / can  
identify brand reliability / knows what to  
expect etc.

recognise as something seen before  
in case of need to contact  
in descending order – by weight – may  
have allergies etc. so need to avoid  
for best results / new product /  
inexperienced

to maintain best condition

to give ideas to consumer

to give information on new products

can calculate unit cost / make comparisons

reduced fat / no added sugar / added vit. C

so vegetarians know it is a suitable product

gluten free / coeliacs can consume

to tell how to dispose of packaging

to give nutritive value per 100g

may be counting calories / to lose weight

useful for diabetics

states amount of saturated fat – may have

CHD – or want a healthier diet

to control intake if high blood pressure

may wish to avoid / allergies etc.

allergies etc.

if on special offer / can compare products

suitable for certain religions

ensures that food is still fresh

to know how many can be served

50% of vitamin C etc.

ability to select / boycott products

10 points: 2 points = 1 mark

[5]

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(c) The use of additives in processed food

nutritional – vitamin C in fruit juice, calcium in white flour, vitamins A and D in margarine  
 preservative / extend shelf life / preserve / reduce spoilage  
 make food more attractive / add colour – flavour – aroma  
 to replace colour / flavour / nutrients lost during processing  
 can improve texture / consistency – stabilisers in ice cream etc.  
 emulsify fat and water – prevent separating – mayonnaise etc.  
 antioxidant – prevent rancidity in fats  
 can be natural but not found in the food added to  
 or synthetic – e.g. vitamin C can be made synthetically  
 can be artificial colours and flavours etc. – E numbers have been approved by European  
 Community – must be used in the smallest amount possible to give desired effect  
 some people are allergic / intolerant to certain additives – cause rashes / asthma / chest  
 pains (MSG), hay fever symptoms etc.  
 hyperactivity in children – associated with tartrazine – in cordials, sweets  
 long-term effect is not known – MSG banned in some countries  
 must be stated on packaging if contained in product  
 danger of adding nut extracts for those allergic to nuts etc.  
 may be used to increase sales – longer shelf-life – prevent waste  
 use to help to make new foods – instant desserts etc.

10 points: 2 points = 1 mark

[5]

[Section B Total: 45]

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- 8 (a) Explain why some people choose to follow a vegetarian diet and suggest ways to ensure vegetarians have enough High Biological Value (HBV) protein in their diet.

Identify and discuss problems that could be associated with vegetarian diets.

**Answers may include the following knowledge and understanding.**

Reasons for choosing a vegetarian diet

religious beliefs – Hindus and Buddhists are vegetarian etc.

follow traditions of family – brought up to follow vegetarian diet etc. – peer group pressure

object to the slaughter of animals – think it is cruel – believe that animals have a right to life – object to the way animals are reared, kept in overcrowded conditions etc.

expensive to rear animals – land could be used for crops – more people could be fed from the same area

dislike animal flesh – taste/texture etc.

meat is expensive to buy – difficult to store without refrigeration

belief that vegetarian diet is more healthy – animal fat has cholesterol – associated with CHD

recent health scares – bird 'flu, BSE, Salmonella from eggs / chickens etc. / allergies

green issues – methane from cows

Types of vegetarian diet

vegan / strict vegetarian consumes nothing of animal origin

lacto-vegetarian no animal flesh but consumes milk and its products

ovo-vegetarian no animal flesh but eats eggs

lacto-ovo-vegetarian no animal flesh but consumes milk, eggs and products

Ways to include HBV protein in vegetarian diets

lacto-vegetarians, ovo-vegetarians and lacto-ovo-vegetarians will get HBV – protein from milk, cheese and eggs

Quorn – mycoprotein – made to resemble meat – sausages / cutlets / mince

sliced meat substitutes for sandwiches etc. – not suitable for vegans – fibres stuck together with egg albumen

vegans – soya beans – contain all indispensable / essential amino-acids – only HBV from a plant source – soya products

flour – milk – tofu – tempeh etc. (not oil) – TVP

oil removed from beans – remainder is extruded into fibres – made to resemble meat – used in sausages / pies / curries etc.

combine LBV protein foods – in same meal – complementary protein

IAAs missing in one food can be supplied by the other

forms HBV protein – improves quality of protein in meal – e.g. nuts / pulses / cereals – beans on toast / lentil soup and bread etc.

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Problems which could occur for those who follow a vegetarian diet

shortage of vitamin A / retinol – add red/orange vegetables – green vegetables – marg

fortified with vitamin A supplied as beta-carotene – converted to vitamin A in body

shortage of vitamin B2 / riboflavin – include nuts / cereals / pulses / potatoes

may lack vitamin B12 – deficiency causes pernicious anaemia supplied by yeast extract – added to breakfast cereals

vitamin D – to absorb calcium – fortified margarine – sunshine

calcium – fortified breakfast cereals – nuts / pulses / cereals

iron – fortified breakfast cereals / soya / green vegetables etc. – iron supplied as non-haem

iron to vegans converted from ferric to ferrous form – by vitamin C – and stomach acid

changes from non-haem iron to haem iron

vitamin C – to ensure absorption of iron – named fresh fruit and vegetables

may be low in energy – high in water content/fruit and vegetables

bulky due to cellulose – cannot eat enough to supply all nutrients – cook some fruit and

vegetables to reduce bulk eat snacks – cereals / nuts / fruit / vegetables – energy dense

lack of variety – use herbs and spices – vary cooking methods

packaged / processed foods may contain ‘animal’ products

check ingredients list – know E numbers to avoid

may cause upset to digestive system – too much cellulose etc.

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8 (a) Mark Bands	Descriptors	Part Mark
High	<p>can probably identify 2 or 3 types of vegetarian diet</p> <p>usually describes each of those named</p> <p>can give several reasons for choosing vegetarian diet</p> <p>mentions several ways of including HBV in diet</p> <p>illustrates answer with examples</p> <p>is aware of several possible problems for vegetarians</p> <p>explains how many of them can be addressed</p> <p>information usually accurate</p> <p>uses technical terms appropriately</p> <p>all parts of the question addressed</p> <p>answers are specific</p> <p>points are usually explained well</p> <p>sound knowledge of the topic will be apparent</p>	11–15
Middle	<p>can identify 1 or 2 types of vegetarian diet</p> <p>usually describes at least one type</p> <p>can give 2 or 3 reasons for choosing vegetarian diet</p> <p>information is not always accurate</p> <p>can identify several possible HBV foods</p> <p>probably gives examples to illustrate</p> <p>is aware of some of the possible problems</p> <p>may indicate how they could be addressed</p> <p>answers may be general</p> <p>detail lacking in some areas</p> <p>information tends to be superficial</p> <p>technical terms not always appropriately used</p> <p>not all points are explained well</p> <p>some parts of question answered at length</p> <p>at least one part will be considered briefly</p> <p>gaps in knowledge will be obvious</p>	6–10
Low	<p>can identify at least one type of vegetarian diet</p> <p>may not be able to define</p> <p>can give 1 or 2 reasons for following vegetarian diet</p> <p>may list sources of HBV protein</p> <p>little attempt to explain their suitability</p> <p>formation is general</p> <p>may consist of lists of facts</p> <p>little use of technical terms</p> <p>not all information given is accurate</p> <p>may not consider all parts of question</p> <p>response to the question will probably be brief</p> <p>limited knowledge of the topic will be apparent</p>	0–5

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- 8 (b) Cows milk is important in the diet but it does not keep long unless it is treated or made into another dairy product.

Discuss this statement under the following headings:

- (a) nutritive value of milk;  
 (b) different methods of treating milk to extend its shelf-life;  
 (c) dairy products.

[15]

Answers may include the following knowledge and understanding.

(a) Nutritive value of milk

HBV – protein – casein – lactalbumin – lactoglobulin – fat – vitamin A – vitamin D – calcium – phosphorus – thiamin – riboflavin – little nicotinic acid – lactose – no NSP – no vitamin C  
 high proportion of water  
 functions of named nutrients

(b) Methods of treating to prevent souring

**Pasteurised** 72 °C (162 °F) – 15 seconds

OR 63 °C (145 °F) – 30 minutes

cooled rapidly – to not more than 10 °C – destroys harmful (pathogenic) bacteria

**Sterilised** homogenised – 113 °C (235 °F) – 15 to 40 minutes

**UHT** 132 °C (270 °F) – 1 second – cooled rapidly – sealed – foil-lined containers – store at room temperature if unopened

**Dried** homogenised – may be skimmed – water removed – by spray drying – fine jet into chamber of hot air – water evaporates – powder falls to bottom

OR roller drying – spread onto heated rollers – water evaporates – film of dry milk scraped off

**Condensed** homogenised – heated to 80 °C (176 °F) – 15 minutes – sugar added – heated in vacuum – some water removed – cooled – sealed in cans

**Evaporated** as condensed milk – no addition of sugar – sealed cans – sterilised – 20 minutes – 115.5 °C (240 °F)

**Frozen** – pasteurised homogenised milk – in polythene bags – up to 1 year – pasteurised milk not suitable – separates on thawing

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(c) Dairy products**Butter**

cream separated from milk – pasteurised – held at 4 °C – to acidity – cooled to 7 °C – churned – fat globules stick together – buttermilk drained off – fat chilled – washed – hardened – salt added – for flavour – and to preserve – worked until smooth

**Cream**

milk left to stand for 24 hours – cream forms a layer on surface – skimmed off – cooled – pasteurised – single/double/whipping – can be acted upon by lactic acid bacteria – soured cream

**Cheese**

many varieties – pasteurised milk used (usually) – bacteria culture added – converts lactose to lactic acid – acid helps to preserve cheese – heated – 30 °C – rennet added – milk clots – caseinogen coagulates with acid – left for 45 minutes – curds and whey formed – curd cut – whey drained off – curd scalded to 30 °C – 45 minutes – stirred – cut into blocks – piled up – drained – cut into chips – salt added – packed into moulds – pressed for 24 hours – sprayed with hot water – to form rind – ripens – at 110 °C – for 4 months – develops flavour – smell – texture – mature cheeses ripened longer – cottage/blue-veined/cream/

**Yoghurt**

made from all types of milk – homogenised – pasteurised – at 85-95 °C – cooled – bacteria added – lactobacillus bulgaricus – streptococcus thermophilus – incubated 4 – 6 hours – becomes acidic – flavours develop – proteins coagulate – cooled – flavours etc. added

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Mark Bands	Descriptors	Part marks
High	candidate can name several nutrients with functions can state at least 3 methods of treating milk and can give details of methods can name at least 3 dairy products gives details on their production comments are precise and related to specific examples information given is accurate	11–15
Middle	can name many of the nutrients in milk some functions are stated can state at least 2 methods of treating milk and can give some details of methods can name at least 2 dairy products and can give some information on production some gaps in knowledge terminology not always accurate information given in not always precise	6–10
Low	can name a few nutrients functions not always known 1 or 2 brief notes on methods of treating milk 1 or 2 dairy products mentioned information not always accurate general information poor knowledge of production limited knowledge of the topic apparent	0–5