CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2012 series

0648 FOOD AND NUTRITION

0648/12 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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

CAMBRIDGE
International Examinations

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]

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]

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]

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]

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]

(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]

(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]

(b) The information on food labels

some information is a legal requirement

name of product	so customer knows what is being bought
description	further details e.g. tuna in brine / can identify brand reliability / knows what to expect etc.
name of manufacturer	recognise as something seen before
address of manufacturer	in case of need to contact
ingredients	in descending order – by weight – may have allergies etc. so need to avoid
cooking instructions	for best results / new product / inexperienced
storage instructions	to maintain best condition
serving suggestions/recipes	to give ideas to consumer
picture of product	to give information on new products
weight	can calculate unit cost / make comparisons
special claims	reduced fat / no added sugar / added vit. C
vegetarian society symbol	so vegetarians know it is a suitable product
wheat ear symbol	gluten free / coeliacs can consume
recycle symbol	to tell how to dispose of packaging
nutritional information	to give nutritive value per 100 g
kilocalorie content	may be counting calories / to lose weight
sugar content	useful for diabetics
fat content	states amount of saturated fat – may have CHD – or want a healthier diet
salt content	to control intake if high blood pressure
additives identified	may wish to avoid / allergies etc.
may include nuts	allergies etc.
price	if on special offer / can compare products
Halal information	suitable for certain religions
use by / best before dates	ensures that food is still fresh
portions provided	to know how many can be served
percentage of R.D.A. of certain nutrients	50% of vitamin C etc.
country of origin	ability to select / boycott products

10 points: 2 points = 1 mark [5]

(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]

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

Identify and discuss problems that could be associated with vegetarian diets. [15]

Answers may include the following knowledge and understanding.

Reasons for choosing a vegetarian diet
religious beliefs – Hindus and Buddists 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.

Problems which could occur for those who follow a vegetarian diet
shortage of vitamin A / retinol – add red/orange vegetables – green vegetables – margarine 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.

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

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

(c) Dairy products

Butter cream separated from milk – pasteurised – held at 4 °C – to develop 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 thermophillus – incubated 4 – 6 hours – becomes acidic – flavours develop – proteins coagulate – cooled – flavours etc. added

Mark Bands	Descriptors	Part marks	Total
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	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	