

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**GCE Advanced Level**

## **MARK SCHEME for the October/November 2013 series**

### **9336 FOOD STUDIES**

**9336/01**

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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1 (a) Anaemia

**Causes**

Iron deficiency anaemia - lack of iron-providing foods -  
 lack of vitamin C -  
 blood loss - e.g. surgery / childbirth / menstruation etc. -  
 destruction of red blood cells -  
 iron needed for formation of haemoglobin - in red blood cells -  
 to transport oxygen - to oxidise glucose in cells - to release energy  
 low haemoglobin - less oxygen - less energy released -

Megaloblastic anaemia - lack of folate and vitamin B12 -

Impaired DNA synthesis – prevents cell division  
 Fewer / larger - irregular-shaped red blood cells -  
 so less oxygen carried

Pernicious anaemia

lack of intrinsic factor in gut needed for absorption of vitamin B12 -  
 B12 not absorbed

**Symptoms**

pallor - tiredness - dizziness - headaches etc.

**Remedies**

sources of iron - e.g. red meat / dark green vegetables / eggs /  
 fortified cereals / dark chocolate etc.

sources of vitamin C - e.g. citrus fruit / blackcurrants /  
 green vegetables / peppers etc.

sources of folate - e.g. green vegetables / liver / yeast extract

sources of vitamin B12 - e.g. meat / milk

Max of 1 food example for each correct nutrient

Do not accept supplements

10 points covering all areas

2 points = 1 mark

[5]

(b) Osteoporosis

**Causes**

loss of all bone components - especially calcium - in old people over 50 -  
 particularly women - after menopause - body draws calcium from the bones -  
 linked to reduced productions of oestrogen -  
 not caused by a lack of calcium - or vitamin D

**Symptoms**

loss of bone density - shrinkage in height - aches in bones -  
 bones become porous - fracture more readily

**Remedies**

Phosphorous – in all foods

plenty of dietary calcium - from milk / cheese / green vegetables / fortified breakfast  
 cereals / white bread etc.

vitamin D for calcium absorption - milk / cheese / oily fish /  
 fish liver oil / margarine / butter / sunshine etc.

regular exercise - as preventive measures -

adequate supply of calcium at younger age -

to ensure bones are strong

Accept 1 food example for Vitamin D and sunshine

10 points covering all areas

2 points = 1 mark

[5]

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(c) Goitre

**Causes**

insufficient intake of iodine -  
 common in areas a long way from the sea -  
 where soil contains little iodine -  
 needed by the thyroid gland - for formation of thyroxin - a hormone  
 involved in the regulation of the rate of oxidation of nutrients in body cells

**Symptoms**

enlargement of thyroid gland -

**Remedies**

use of iodised table salt - has potassium iodide added -  
 sea fish / salt water fish - vegetables grown near the sea -  
 seaweed etc.

10 points covering all areas

2 points = 1 mark

[5]

(d) Night blindness

**Causes**

lack of vitamin A (retinol) - needed to synthesise rhodopsin -  
 visual purple - a light-sensitive pigment - in retina of the eye -  
 which helps eyes to adjust to dim light -

Or (Not awarded twice)

**Symptoms**

vision in dim light is impaired -

**Remedies**

Animal food - foods rich in vitamin A include milk / cheese / butter / egg yolk /  
 fish liver oil / margarine etc.

plants - contain beta-carotene -

which can be converted into vitamin A in the body -

but is only one sixth as valuable as consuming vitamin A -

found in orangey-red fruits and vegetables -

e.g. carrots / papaya / red peppers

Max 1 food for retinol

Max 1 food for beta carotene

10 points covering both areas

2 points = 1 mark

[5]

(e) Scurvy

**Causes**

vitamin C (Ascorbic acid) deficiency - needed for absorption of iron

formation of haemoglobin - transport oxygen from lungs to cells -

to oxidise glucose - and release energy -

needed for the formation of collagen -

main protein of connective tissue - protects organs -

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### Symptoms

spontaneous bruising - as small blood vessels break - haemorrhaging under skin - gums become black - and spongy /swollen gums  
teeth become loose - wounds heal slowly - fractures slow to heal -  
caused by failure to form connective tissue -  
may also have anaemia - failure to absorb iron -  
inability to form red blood cells - change in bone structure

### Remedies

regular intake important since vitamin C cannot be stored in the body -  
e.g. blackcurrants, citrus fruit, rose hips, melon, strawberries, green vegetables, green peppers, new potatoes  
take care to avoid loss of vitamin C when preparing, cooking and serving green vegetables -  
water soluble - destroyed by heat -  
oxidises etc. - raw fruit and vegetables contain most vitamin C -  
some foods are fortified with vitamin C - some fruit juices etc. -  
read packaging to compare with RDI etc.

Max 1 food example

10 points covering all areas                      2 points = 1 mark                      [5]

## 2 (a) Digestion of food in the small intestine

### **Duodenum**

#### Protein

trypsinogen - from pancreatic juice - is activated by enterokinase - in intestinal juice - to become trypsin -

trypsin converts protein into peptides

#### Fat

bile - made in liver - stored in the gall bladder - emulsifies fat/ breaks into small droplets - increases surface area

lipase - from pancreatic juice - converts fat to fatty acids - and glycerol

#### Carbohydrate

amylase - from pancreatic juice - converts starch to maltose -

### **Ileum**

#### Protein

erepsin - from intestinal juice - converts peptides to amino acids -

#### Fat

lipase - from intestinal juice - completes breakdown of fat into fatty acids and glycerol

#### Carbohydrate

intestinal juice - contains maltase - converts maltose to glucose -

lactase - converts lactose to galactose and glucose -

sucrase / invertase - converts sucrose to glucose and fructose -

24 points    2 points = 1 mark    [12]

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**(b) Absorption of nutrients in the ileum**

Protein

amino acids absorbed through microvilli - by active transport - into blood capillaries - of villi - then to liver - via hepatic portal vein

Fat

glycerol and fatty acids - reform into fats - in walls of villi - pass into lacteal - then into lymphatic system - by diffusion - and active transport - now called chylomicrons

Carbohydrate

villi - finger-like projections - increase surface area of ileum - (can show on a diagram) - well supplied with blood capillaries - monosaccharides (glucose, galactose, fructose) absorbed directly into bloodstream - pass to liver - via hepatic portal vein

Minerals

only about one third of **calcium** is absorbed - remainder is lost from the body in faeces - vitamin D aids absorption otherwise little would be absorbed - lactose increases absorption - phytic acid - and oxalic acid - react with calcium - preventing absorption

only about 5%-20% **iron** is absorbed - depends on the body's need for iron - depends on the form of iron - haem iron - ferrous - more easily absorbed - non-haem iron - ferric - can be reduced to ferrous - by vitamin C - so aids iron absorption - phytic acid - oxalic acid - and tannin - reduce iron absorption

Vitamins

vitamin A and vitamin D are fat soluble - absorbed with fat

**N.B.** Avoid crediting some information more than once e.g.

villi - liver - hepatic portal vein etc.

26 points

2 points = 1 mark

[13]

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3 (a) Characteristics of fats and oils and uses in preparation of dishes

**Characteristics**

fats are esters - result of reaction between acids and alcohol -  
 3 hydroxyl groups of the glycerol molecule can each combine with a fatty acid molecule to give a triglyceride - a type of ester -  
 each molecule could have more than one type of fatty acid - glycerol common to all  
 difference between fats and oils due to different fatty acids in composition -  
 saturated fatty acids - all carbon molecules saturated with hydrogen - hard -  
 all c-c bonds within molecule are single -  
 monounsaturated - one double bond between adjacent carbon atoms -  
 can take up more hydrogen - soft fat -  
 polyunsaturated - more than one double bond between adjacent carbon atoms  
 can take up more hydrogen -  
 saturated fats usually from animals - polyunsaturated usually from plants  
 fish oils are unsaturated -  
 double bonds are a point of weakness -  
 can readily be broken by a range of substances -  
 Max 4 for correct diagrams  
*cis fatty acids - hydrogen atoms on same side of double bond -*  
*trans fatty acids -*  
*hydrogen atoms diagonally opposite each other at double bond - DO NOT CREDIT in (a) and (b)*

(could give some of this information in a diagram)

fats melt over a range of temperatures - depending on fatty acids -  
 as temperature rises some fatty acids will melt - others remain solid -  
 this allows solid triglycerides to move within the fat - fat is spreadable -  
 softer fats spread more readily - shape changes with pressure -  
 plasticity of fat affects creaming and shortening properties -  
 pure fats such as lard have more shortening power than butter or margarine -  
 because they contain water -  
 creaming power of a fat is measured by its capacity to incorporate air bubbles  
 a fat with a wide plastic range is best for creaming -  
 hydrogenated vegetable fats are better than butter -  
 butter has a narrow plastic range -

*fats and oils have different smoke points - high smoke point for frying -*  
*otherwise food will absorb fat or oil -*  
*different fatty acids have different flavours - affect acceptability -*  
*oils hydrogenated to form fats - process can be halted at varying stages -*  
*to give desired hardness for intended use etc.*  
*last points should not be credited in section (a) and (b)*

**Uses**

spreading - flavouring - forming an emulsion - shortening - aeration - frying - adding colour -  
 improving keeping quality - emulsifies with moisture - to retain moisture - e.g. in rich cakes  
 1 use + 1 fat example = 1 mark  
 increasing calorific value without adding bulk - e.g. fried foods etc.  
 sealing - melted butter on pate sets on cooling - prevents surface drying -  
 lubrication - prevents food sticking to cake tins etc. -  
 makes food easier to eat - e.g. butter on bread compared with dry bread etc.

Max 5 for characteristics

Max 5 for uses of fat

20 points

2 points = 1 mark

[10]

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**(b) (i) Rancidity**

refers to the spoilage of fats and oils -  
 hard fats are resistant to oxidative rancidity -  
 contain fewer double bonds -  
 fish oils are highly unsaturated -  
 more susceptible to this type of rancidity -  
 give unpleasant odour - and flavour -  
 caused by formation of aldehydes and ketones -  
 accelerated by heat - light - traces of metals e.g. copper, iron -  
 oxidative rancidity produces free radicals -  
 anti-oxidants absorb oxygen - prevent formation of free radicals -  
 e.g. vitamins A, C and E -  
 enzymes / lipase hydrolyses fats - breaking them down to glycerol and fatty acids  
 unpleasant taste of rancid butter due to the fatty acid butyric acid -  
 can be reduced by storing in a cool, dark place - non-metal container  
 well wrapped

6 points

2 points = 1 mark

[3]

**(ii) Smoke point**

the point at which a fat or oil begins to decompose -  
 because the temperature is too high -  
 depends on the percentage of free glycerol within the fat -  
 or the ease with which fats are hydrolysed to release glycerol -  
 irreversible - smoke point will affect choice of fat for deep frying -  
 deep frying needs a fat or oil with a higher smoke point -  
 heating above smoke point causes fats and oils to ignite -  
 flavour and smell affected - bitter flavour - acrid smell - acrolin -  
 free fatty acids reduce the temperature of the smoke point  
 breakdown of glycerol leads to acrolein - irreversible

6 points

2 points = 1 mark

[3]

**(iii) Hydrogenation**

process by which oils are converted into fats -  
 vegetable oils are more readily available in some countries -  
 unsaturated fats become saturated -  
 degree of hydrogenation can be controlled - nickel catalyst -  
 can be trans fatty acids - hydrogen atoms opposite at double bond  
 or cis fatty acids - hydrogen atoms on same side of double bond  
 research has shown that trans fatty acids are more unhealthy -  
 association with cholesterol - and CHD  
 to give fats with different degrees of hardness  
 by addition of hydrogen - across a double bond -  
 use in the manufacture of margarine and cooking fats  
 do not credit same pts as in a e.g. trans and cis fatty acids

6 points

2 points = 1 mark

[3]

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- (c) Reasons for reducing fat in the diet  
 high fat intake may cause obesity - caused by accumulation of fat -  
 classified as obese if more than 1/3 of body weight is fat -  
 by overeating /more calories than required - excess fat is stored -  
 under skin/as adipose tissue - and around internal organs -  
 usually less active - so calories not burnt off - more weight gain -  
 puts strain on the heart - coronary heart disease - strokes -  
 hypertension - poor blood circulation - when arteries are narrowed - more difficult for  
 blood to flow - may damage artery walls - breathing difficulties  
 low self-esteem - problems during surgery - arthritis -  
 additional weight on joints -  
 saturated fat - usually from animals - contains cholesterol -  
 deposited on artery walls - narrows /blocks -  
 leads to heart attack if coronary artery is blocked  
 or stroke if blood vessel in brains is blocked -  
 diabetes mellitus - high level of blood glucose - not enough insulin -  
 produced by pancreas - glucose excreted in urine -  
 may cause damage to nervous system/ eyes/ kidneys/ feet etc.  
 12 points  
 2 points = 1 mark [6]

4 (a) Structure of protein

**Primary Structure**

protein chain is a sequence of amino-acids  
 amino acids combine through their amino and carboxyl groups  
 known as a peptide bond  
 most basic / simplest protein structure  
 two amino acids (condense to) form a dipeptide - water eliminated – condensation reaction  
 polypeptides formed when many amino acids combine  
 polypeptides are chains of hundreds or thousands of amino acids  
 22 amino acids in food Linked together in a variety of combinations to make many different  
 protein

**Secondary Structure**

primary structure of protein is folded  
 to form an alpha helix/spiral - and beta pleated sheet  
 stability of structure depends on presence of hydrogen bonds

Allow diagrams – max 2

12 points covering both areas 2 points = 1 mark

[6]



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(b) Globular and fibrous proteins

**Globular**

are bonded or compact shaped molecules - round ball -  
*albumins* - e.g. ovalbumin (egg white), lactalbumin, blood plasma  
soluble in water - and dilute salt solutions - coagulated by heat  
*globulins* - e.g. lactoglobulin (milk, egg white, muscle cells, blood plasma)  
insoluble in water - dissolve in dilute solutions of electrolytes -  
coagulate on heating- correct ref. to tertiary and quaternary structure

**Fibrous**

fibrous molecules - many twisted in helices - can give elasticity or strength  
others in form of pleated sheets  
insoluble in water - and dilute solutions of salts  
*collagen* - inelastic - high tensile strength -  
connective tissue - e.g. meat, fish  
converted to gelatine - by prolonged contact with boiling water -  
gelatine soluble in water - more susceptible to enzymic digestion  
*elastin* - present in elastic tissues - e.g. artery walls (meat), skin, tendons  
unchanged by heat- correct ref. to tertiary structure

14 points to include named types of protein  
named examples of types identified

structure of globular and fibrous protein  
reference to solubility, coagulation etc.

2 points = 1 mark

Diagrams – max 2

[7]

(c) Effects of heat, agitation and acids

*Heat* - denaturation begins at 40 °C  
coagulation - begins at approx. 60 °C -  
setting - e.g. custards  
coating - e.g. fish  
binding - rissoles  
setting of gluten - e.g. bread - to hold risen structure of baked goods  
*Lactalbumin forms skin on milk*

*Agitation* - foam formation - unfolding of globular proteins -  
to entangle air - causes partial coagulation of protein -  
whisking of egg white - e.g. meringue  
whisking of egg and sugar to trap air - e.g. sponge cakes

*Acid* - inactivation of enzymes / denaturation - above optimum pH  
marinade meat in lemon juice / vinegar / wine - soften protein  
food preservation - e.g. pickled herring  
bacteria in milk ferment lactose into lactic acid - pH lowered -  
milk protein coagulates - forms a curd / curdles

Must discuss all 3 for full marks

16 points - at least 3 points from each area

2 points = 1 mark

[8]

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(d) Deamination

removal of nitrogen from amino acids / amino group  
deamination occurs if protein intake is greater than need  
in liver - produces ammonia – converted to urea  
leaves body via kidneys - in urine - toxic -  
deaminated molecules are converted to pyruvic acid -  
which is oxidised to release energy - or stored as fat -

8 points 2 points = 1 mark

[4]

5 (a) Factors affecting food choice

**Availability of food**

depends on where people live - type of land - climate - hurricanes -  
droughts - how they affect the cultivation of particular foods -  
foods grown locally - land may not favour animal rearing -  
or growing particular crops -  
availability of transport to bring foods grown elsewhere -  
different foods grow / are available in different countries -  
those in developing countries may have little choice of food -  
no trade with others - poor countries cannot afford to import foods - depends mainly on  
staple food - rice / maize etc. –  
cannot afford agricultural developments therefore little variety -  
wealthy countries import food - e.g. bananas / coffee / oranges etc. -  
wealthier countries have developed technologically -  
new preservation methods -  
canned / dried etc. - ownership of home freezers - new storing methods - previously  
unknown - e.g. AFD - creation of new foods -- e.g. TVP -  
increases availability of convenience foods - more expensive -  
depends on income -  
more people work outside the home in developed countries -  
more disposable income - foods in season - home-grown produce -  
proximity to local markets - storage facilities - left-over food to use - etc.

**Culture and religion**

choose foods liked by families - habits - conditioning -  
each culture has its own eating patterns - and styles of cooking -  
may be influenced by availability of low-prices, locally-grown food -  
e.g. rice in China and India / potatoes in Britain -  
wheat used for pasta in Italy - and for bread in UK -  
vegetarian families - children must follow - same attitude towards foods -  
may not be able to change until old enough to make own food choices -  
each culture has its own foods - often based on religious beliefs -  
e.g. cow sacred to Hindus - Jew and Muslims must have animals slaughtered in a particular  
way -  
Roman Catholics eat fish on Fridays - some dishes associated with festivals -  
Christmas cake - Turkey for Thanksgiving in USA - dishes associated with occasions -  
wedding cake / birthday cake with candles

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### **Advertising and packaging**

- choice can be affected by how foods are shown to consumers -
- television / newspaper adverts - displays in stores - taste-testing -
- some advertisements appeal to children - sweets / McDonald's -
- children more easily persuaded than adults - sweets at till -
- tempted by free gifts / money off coupons / special offers -
- to introduce new foods - attracted by colours of packaging - endorsements - health claims
- peer pressure -
- advertising convinces people that they 'should' buy certain foods -
- packaging gives information - what is in package - some may be poor readers - serving suggestions -
- make food look appealing - may give nutritional information -
- manufacturers consider their role as educators -
- some people choose foods with the least packaging - environmental issues -
- waste of resources - others find packaged foods easier to store -
- boxes easy to stack - saves time - can be stored as soon as food is brought home protects food from damage - contamination - tampering

### **Physiological and psychological attributes**

- depends how hungry the individual is - time available -
- appearance - flavour - aroma and texture of food -
- likes and dislikes - importance for appreciation of food -
- will repeat if experience is favourable - individual perceptions of food -
- occasion - entertaining - creating an impression -
- comfort food - relief from stress, boredom etc. -
- easy to eat too much in some circumstances - snack foods etc. -

### **Nutritional knowledge and skill**

- food choice may be affected by its nutritional value -
- knowledge from school /home - may depend on level of education -
- differs between countries - nutrition may not be taught to everyone in school
- publicity campaigns in media - to increase awareness - and knowledge -
- need to know the functions - and dangers of food - sources of nutrients -
- in order to choose wisely - well-publicised dangers of excess fat / sugar / salt
- danger of CHD / obesity / hypertension - greater in affluent countries -
- cheaper sources of HBV protein are just as valuable in diet -
- milk / cheese / eggs -
- cheaper cuts of meat can be tenderised - complementary proteins used -
- cereals / pulses / nuts in same meal - improve quality of HBV protein -
- skill may depend on teaching in school - or at home -
- younger people may lack skill -
- less time spent at home - paid work outside home -
- more use of processed food - reduces preparation and cooking skills -
- may avoid certain meat / fish / fruit etc. -
- may buy convenience foods -
- e.g. puff pastry
- or may be skilled at limited dishes - choose foods to make those -
- lack variety - may cook as a pastime - cake decoration etc. -
- learn how to choose accordingly - expect success - to avoid waste -
- if dishes do not turn out well, will not repeat -
- more costly to buy ready-made food - but know the result to expect -
- to pay for reliability -
- e.g. choux pastry etc.

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### Cost

depends on money available to spend on food - need to budget -  
 poorer people must spend a higher proportion of income on food -  
 staple foods cheap - filling - can be basis of meals - local recipes etc. -  
 may be a status symbol for rich people - spend more than they can afford -  
 e.g. smoked salmon / caviar -  
 cost is not related to nutritional value - may depend on supply available -  
 or demand for the food - *cheaper foods can have high nutritive value* -  
 e.g. milk / cheese / eggs - can choose cheaper sources of HBV - **DO NOT CREDIT IF CREDITED ELSEWHERE**  
 pulses / cereals etc. - protein complementation - grow own produce -  
 keep chickens for family consumption - use food in season - special offers -  
 buy locally - reduce transport cost - foods in season are usually cheaper -  
 make rather than buy ready-made food - careful use of convenience foods -  
 nutritious diet may need not be expensive - reduce purchase of junk food -  
 judge amount required - to avoid waste - use left-over foods -  
 poor people may receive government help - free school meals / food aid  
 poverty limits choice of food -  
 those with unlimited income may make poor choices -  
 convenience foods often contain a lot of fat -  
 high sugar - high salt - risk of obesity - CHD - hypertension -  
 low in NSP - etc.

Half marks for 1-2 sections. Must discuss all sections for full marks

30 points 2 points = 1 mark (credit same point only once) [15]

### (b) Recommended Daily Intake (RDI)

RDI is the estimated intake of nutrients to achieve healthy living. 1 whole mark for this statement

The RDI varies between individuals according to their age and activity level.

It represents an approximate amount of each nutrient required each day.

Can help individuals to assess whether the food eaten is adequate for their daily need. They can compare the nutritional value of the food eaten with the nutritional requirement. Make definition more explicit

Allows individuals to plan meals so that they do not exceed their RDI -

Especially important to avoid deficiency diseases -

or consuming more energy-giving food than the body can use.

RDI is only a guide - can see how diet could be improved to supply RDI s etc.

Definition of RDI

+ 4 points

2 points = 1 mark

1 mark

[3]

### (c) Importance of nutritional information on packaging

allows individuals to monitor intake of nutrients - compare with RDI

may be on a special diet - diabetic - CHD - hypertension etc.

need to avoid / have a reduced intake of fat / saturated fat / salt / sugar etc.

can compare the nutritional value of different products and make choices -

can learn that different foods and be used together to compensate for high / low levels of particular nutrients to give an average intake -

may be controlling calorie intake - can calculate the total value of food eaten

given per 100g - for easy comparison between products - and per product -

so that calories consumed can be calculated etc.

14 points

2 points = 1 mark

[7]

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6 (a) Reasons for including sauces in meals

- to provide a contrasting flavour - cheese sauce with cauliflower etc.
- to enhance the flavour - mint sauce with lamb etc.
- to provide a contrasting texture - parsley sauce with fish etc.
- to bind ingredients together - fish cakes / potato croquettes etc.
- to add colour - jam sauce with steamed pudding etc.
- to add nutrients - custard etc.
- to reduce richness - orange sauce with duck / apple sauce with pork
- to add interest or variety - chocolate sauce with ice cream etc.
- to add moisture - apple pie and custard etc.
- part of the dish - lasagne / macaroni cheese etc.

6 reasons + 6 examples

12 points

2 points = 1 mark

[6]

(b) (i) Gelatinisation

- suspension of starch in water - separates grains -
- when heated with water -
- water penetrates outer layers of starch granule - softens - swells -
- at 60°C to 80°C - to 5 x original size - mixture becomes viscous -
- at 80°C - starch grains break up - granules dispersed throughout water - long chains of molecules begin to unfold -
- mixture thickens - forms a sol - water enclosed in meshwork - forms a gel - when cooled - thickness depends on type of starch - and proportion used - and temperature of liquid -
- and the effect of other ingredients e.g. sugar etc.

e.g. boiled rice, roux sauce, arrowroot glaze, blancmange, custard etc.

10 points (to include at least one example)

2 points = 1 mark

[5]

(ii) Emulsification

- mixture of oil and water - which does not separate -
- can be oil-in-water -
- e.g. milk, cream, mayonnaise, ice cream, gravy etc.
- or water-in-oil -
- e.g. butter, margarine, egg yolk etc. -
- two liquids which do not normally mix - need an emulsifying agent -
- e.g. lecithin in egg yolk - has hydrophobic group - attracted to oil -
- and hydrophilic group - attracted to water -
- oil molecules are suspended in water -
- small amounts of oil are added at first - e.g. in mayonnaise -
- to ensure thorough emulsification - more oil causes thickening -
- e.g. creamed cake mixture - liquid egg added to creamed fat and sugar
- do not separate / curdle if added gradually -
- lecithin is emulsifying agent -
- (may show in a diagram)

10 points (to include at least one example)

2 points = 1 mark

[5]

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(iii) Coagulation

when heated - protein molecules change structure - denatured -  
 primary structure unchanged - secondary structure altered -  
 cross-linkages break - these maintain shape of molecule -  
 irreversible - molecule unfolds - sequence of amino acids remains the same  
 loses elasticity - hardens / sets - properties of protein alter - less soluble -  
 more viscous - unfolded molecules bond with each other - form clumps –  
 causing protein to harden - egg albumin coagulates at 60 °C - yolk at 70°C -  
 muscle fibres (in meat) shrink - easier to digest by digestive enzymes -  
 occurs more readily with addition of acid -  
 e.g. vinegar in water when boiling eggs -  
 milk protein coagulates with lactic acid when turning sour - forms a curd -  
 salt added to cooking water when boiling eggs - sets albumen which leaks if shell is  
 cracked -  
 enzyme - rennin - coagulates milk - in young children -  
 rennet used commercially - to make junket - and in cheese-making -  
 mechanical action / whisking - partially coagulates protein -  
 molecules unfold - form a network around air - stabilising foam -  
 e.g. meringue, soufflé etc. –  
 e.g. of coagulation include boiled egg, egg custard, egg for coating,  
 skin on boiled milk etc.  
 10 points (to include at least one example)  
 2 points = 1 mark

[5]

(c) Syneresis

loss of water - form a gel - as it shrinks -  
 scrambled egg / baked egg custard are gels - protein shrinks if overcooked - squeezes  
 out liquid which has been enclosed / syneresis occurs -  
 reverse of gelatinisation in a starch sauce - retrogradation -  
 starches which are rich in amylopectin are resistant to retrogradation -  
 water can slowly weep out of a pectin gel during storage -  
 could be due to the presence of too much acid  
 8 points  
 2 points = 1 mark

[4]

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**7 (a) Factors making food dangerous to consume**

growth of bacteria - given correct conditions for growth - body temp (up to 40 C)  
e.g. source of food /moisture /warmth /time /suitable pH -  
bacteria introduced from infected sources - Salmonella from eggs and poultry bacteria in unpasteurised milk - linked to TB -  
unchecked food - BSE - poor conditions in slaughterhouses etc.  
cross-contamination - poor personal hygiene of food handlers /ignorance  
temperature not low enough to prevent bacterial growth -  
multiply once every 20 minutes -  
keeping food too long before use / 'use by' dates not observed -  
blown cans - food has begun to decompose -  
chemicals stored near food - weed killer / insecticides -  
seeds treated with insecticide eaten instead of planting -  
accumulation of metals in the body - e.g. lead/ mercury/ cadmium etc. -  
fish from waters polluted by industrial waste -  
e.g. tuna poisoning by mercury in Japan -  
drinking water poisoned by lead pipes - effluent from chemical factories -  
contaminated olive oil in Spain -  
foods with naturally occurring harmful substances -  
e.g. mushrooms/deadly nightshade/green potatoes/raw kidney beans/oxalic acid (rhubarb)/moulds may produce mycotoxins -  
AVP  
20 points  
2 points = 1 mark [10]

**(b) (i) thaw frozen chicken before cooking**

in cool place - e.g. refrigerator - bottom shelf -  
to prevent liquid dripping onto other food /cross contamination -  
could thaw in microwave oven - quicker -  
less time for bacteria to grow - must melt all ice -  
do not defrost using heat - warmth encourages bacterial growth - wash - remove blood and internal organs - may contain bacteria -  
do not place near cooked food - cross contamination(credit once) -  
if not completely thawed oven heat will only melt ice in centre -  
but will not cook food - temperature will not be high enough -  
bacteria will not be killed -  
will spread to cooked food when removed from oven -  
and given time - causes food poisoning - e.g. Salmonella etc.

**(ii) cook chicken thoroughly**

must reach 70 °C - for 2 minutes - in thickest part / centre - no pink juices - use food probe to check temperature - bacteria destroyed -  
e.g. Salmonella etc.

**(iii) serve immediately**

if kept warm - or stored in a warm kitchen - bacteria multiply -  
given correct conditions - food /warmth/ time -  
bacteria multiply every 20 minutes - food soon becomes dangerous -  
may not be heated again to destroy bacteria -  
if eaten cold may cause food poisoning - no change in appearance -  
so not thought to be unsafe to eat - can contaminate other foods -  
warm food should not be put into refrigerator before cooling -  
raises temperature of refrigerator - encourages bacterial growth etc.

20 points covering all area (*do not credit same point in more than one question part*)  
2 points = 1 mark [10]

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(c) (i) Principles of deep freezing

water turns to ice - below 0 °C - cell contents impure -  
lowers freezing temperature - frozen by -10 °C -  
micro-organisms dormant - water unavailable for bacterial growth -  
some bacteria destroyed - enzyme action slowed down -  
store at -18 °C - enzymes which attack fat are still active - blanching inactivates  
enzymes - reduces bacteria by 90% -  
must be quick frozen - to ensure small ice crystals - at -25 °C -  
food passes through zone of maximum ice crystal formation -  
in shortest time possible - 30 minutes or less -  
does not damage cell walls - large crystals rupture cell walls -  
liquid is lost on thawing - drips out - flavour lost -  
texture / appearance spoilt -  
make sure temperature of freezer is at -25 °C before food is put in -  
freeze small amounts at a time -  
to avoid raising temperature inside freezer etc.

(ii) Advice on use of freezer

use air-tight packaging materials / waterproof / completely sealed -  
to prevent evaporation of liquids - 'freezer burn' on meat etc. -  
dries out surface - cannot be reversed - leave a head space for liquids  
expand on freezing - remove air - suck out with a straw etc.  
air circulation causes moisture loss - label - on dry surface / name / amount / date of  
freezing - use by date / storage time - refer to textbooks for recommended time - e.g.  
polythene bags / wax cartons / plastic tubs - separate layers with plastic film etc. - use  
in rotation - pack in useable amounts - keep freezer full -  
for maximum efficiency -  
food packed together maintains low temperature more efficiently -  
defrost every 6mths / do not allow the ice to build up  
10 points - at least 4 points from each area  
2 points = 1 mark  
Even balance on (c) (i) and (c) (ii) for full marks

[5]



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8 (a) Nutritive value of milk

HBV - protein - casein, lactalbumin, lactoglobulin - all IAAs -  
growth - repair - maintenance - enzymes - hormones etc.  
fat - finely divided - tiny droplets in oil in water emulsion -  
easily digested - warmth - concentrated source of energy etc. – forms cell membrane  
carbohydrate - lactose - energy  
calcium - growth of bones and teeth - clotting of blood -  
nerve function - muscle function  
phosphorus - growth of bones and teeth - found in cells -  
release of energy - DNA etc.  
vitamin A - depends on season -  
more in summer milk when cows are fed outside -  
formation of visual purple - perception of light - healthy skin mucous membranes etc.  
vitamin D - absorption of calcium  
riboflavin - release of energy from glucose -  
forms part of enzyme system  
nicotinic acid - oxidation of glucose - release of energy -  
forms part of enzyme system  
thiamine - oxidation of nutrients to release energy -  
acts as co-enzyme in process  
24 points  
2 points = 1 mark

[12]

(b) Problems associated with milk only diet

no vitamin C - required for absorption of iron - formation of collagen connective tissue -  
resistance to infection -  
formation of blood  
no iron - babies born with a 6 month supply -  
but need dietary supply - to prevent anaemia - fatigue etc.  
poor source of vitamin D - absorption of calcium - bones and teeth  
poor source of vitamin A - anti-infection -  
skin and mucous membranes  
little carbohydrate - only lactose - baby needs energy for growth -  
and movement  
high percentage of water -  
would need to consume large amount to gain sufficient nutrients  
no NSP - needed to encourage chewing -  
development of digestive system etc. as child grows  
marasmus - too little food for children under 1 year -  
thin bodies - weak - eventually death  
kwashiorkor - insufficient protein - lack of protein causes anaemia -  
protein needed for formation of blood -  
retarded growth - muscle wasting - enlarged liver -  
fluid retention etc.  
12 points  
2 points = 1 mark

[6]

(c) Advantages and disadvantages of breast feeding and bottle feeding

**Breast feeding**

*Advantages*

nutrients in correct proportion - readily absorbed - free -  
correct temperature - antibodies present in milk - immune system  
protect baby against disease - clean/safe/instant -

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cannot be prepared incorrectly - does not cause allergies -  
bond between mother and child – possible link to increased intelligence

*Disadvantages*

mother's diet may affect child - child may have intolerances -  
tiring for mother - no-one else can help unless milk expressed and stored -  
do not know how much baby has taken - some feel uncomfortable -  
may be intolerance in public places etc. – cracked nipples

**Bottle feeding**

*Advantages*

can monitor the amount of milk taken by baby - others can help –  
allows other members of family to spend time with child -  
can feed in public without embarrassment

*Disadvantages*

equipment needs to be sterilised - danger of bacteria being transferred -  
cost of bottles, formula milk etc. - people may not read instructions carefully - may add too  
little powder / too much water /baby does not get correct amount of food - water may be  
contaminated -  
if left-over milk kept until later bacteria may thrive - perfect conditions -  
some mothers may be influenced by advertising of formula milk -  
unnecessary cost to family etc.

14 points - at least 2 points from each area (*ensure that same knowledge is not credited in  
both sections i.e. do not accept argument and converse as two points*)

2 points = 1 mark

[7]