

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Level

MARK SCHEME for the October/November 2015 series

9336 FOOD STUDIES

9336/01

Paper 1 (Theory), maximum raw mark 100

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Question	Answer	Marks
1 (a)	<p><i>simple sugar</i>: e.g. glucose/fructose/galactose – a monosaccharide – contains five or six carbon atoms – each carbon atom except for one is attached to a hydroxyl group – (OH) – white – crystalline – sweet – soluble –</p> <p><i>intrinsic sugars</i>: are eaten with their associated cell walls, e.g. in fruit and vegetables;</p> <p><i>extrinsic sugars</i>: are free/not contained within cells – e.g. lactose in milk – refined sugar in foods and drinks manufactured with added sugar;</p>	<p>[4]</p> <p>[1]</p> <p>[1]</p>
(b)	<p>iron – needed for the production of haemoglobin/formation of red blood cells – to transport oxygen around the body – helps convert blood sugar to energy;</p> <p>phosphorous – releases energy from food – helps build strong bones and teeth;</p> <p>calcium – gives strength to bones and teeth/maintenance of bones and teeth;</p> <p>calcium and/or iron in wheat can combine with phytic acid which interferes with absorption;</p>	[4]
(c)	<p>sodium – for maintenance of the correct concentration of body fluids – help to transmit nerve impulse – muscle contractions;</p> <p>fluorine – combines with calcium phosphate/combines into tooth enamel – to strengthen teeth – useful in children – when teeth are developing;</p> <p>iodine – required to make thyroxine/thyroid hormone – helps to control the rate of metabolism – essential for brain development – in the fetus;</p> <p>chloride – required for the production of hydrochloric acid in gastric juice – helps to maintain correct concentration of body fluids;</p> <p>manganese – antioxidant – activates enzymes – needed to digest and synthesise fatty acids and cholesterol – and metabolize carbohydrates and proteins;</p> <p>zinc – makes new cells and enzymes – essential for brain function/brain synapses – helps to heal wounds – needed for good prostate health;</p> <p>cobalt – component of B₁₂ – for red blood cell production – prevents pernicious anaemia – important in normal nervous system function;</p> <p>copper– cofactor in some enzymes – helps produce red and white blood cells/to form haemoglobin – helps to make collagen – acts as an antioxidant;</p>	[3]
(d)	<p><i>thiamin</i>: coenzyme – for the release of energy – from carbohydrates – and fats – normal growth in children – function and maintenance of nerves –</p> <p><i>niacin</i>: coenzyme – required for the release of energy – from carbohydrate – and fats –</p>	[4]

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(e)	<p><i>NSP</i> absorb water in the colon – make the faeces soft – and bulky – making it easy to expel – helps to minimise constipation – and diverticular disease/haemorrhoids – provide fuel for bacterial metabolism – increases colonic bacterial mass – and lowers pH – increases bowel mobility – transit time for a typical diet may be 100 h – but just 35 h with high <i>NSP</i> –</p> <p><i>NSP</i> bind the food residues – stimulates peristalsis/giving the muscles something to grip on to – help to remove toxins – reduce the incidence of colonic cancer – help to lower blood cholesterol – in turn helps lower the incidence of CHD – (diets rich in <i>soluble NSP</i>) slow down the release of glucose to the blood/lower blood glucose levels – prevent diabetes – <i>NSP</i> can help in slimming diets as it gives a feeling of fullness – prevents overeating –</p>	[8]
2 (a)	<p><i>in the duodenum</i>: bile – secreted from the liver – emulsifies fats – dispersed in bile in small droplets – pancreatic lipase breaks fat into soluble glycerol – and insoluble fatty acids – fatty acids react with bile to become soluble –</p> <p><i>in the ileum</i>: fat is broken down further – by lipase –</p>	[3]
(b)	<p><i>passive absorption</i>: nutrients absorbed into the bloodstream – are transported across membranes – by <u>diffusion</u> – a passive process not requiring ATP – energy from respiration – and <u>osmosis</u> – a passive process where water diffuses from a less concentrated solution – to a more concentrated solution – until the solutions are the same concentration –</p> <p><i>active transport</i>: molecules are transported across membranes – against a concentration gradient – using a carrier protein – and ATP – energy from respiration –</p>	[6]
(c)	<p>calcium found in green leafy vegetables – is made unavailable to the body by the presence of cellulose – which the body cannot digest –</p> <p>calcium in wholegrain cereals – can be made unavailable to the body when it combines with phytic acid in the cereal – oxalates – present in spinach/rhubarb – react with calcium – to form calcium oxalate – which is insoluble – therefore calcium becomes unavailable to the body –</p> <p>tannins in tea and coffee hinder absorption – phosphorous – and vitamin D – must also be available in sufficient quantities for calcium to be fully used –</p>	[6]
(d)	<p>blood sugar levels are lowered – when glucose – present in the bloodstream – is taken up into the body's cells – when a signal/brain message – is sent to the pancreas – to produce insulin – some glucose can then be converted to glycogen – in the liver – for later use –</p>	[4]
(e)	<p>when too much protein is eaten – amino acids – are broken down – by <u>deaminases</u> – in the liver – to carbon, hydrogen and ammonia – ammonia converted to urea – and excreted –</p>	[3]

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(f)	during normal absorption – a protein called CFTR – acts as a chloride channel – and regulates the transport of sodium/ chloride/ bicarbonate – a faulty gene – can cause CFTR – to allow too much sodium chloride – and not enough water into the cells of the body –causing thick mucus to build up – in the lungs and intestines –	[3]
3 (a)	<i>vitamin C</i> : quickly and easily destroyed – prepare foods just before eating – tear cabbage instead of cutting – to avoid damage to cells – avoid exposure to light – destroyed by dry and moist heat – dissolves in cooking water – in storage, is oxidised – when exposed to air – oxidation is accelerated by heat – and exposure to metal ions like copper – becomes unavailable to the body – alkali/ bicarbonate of soda – cause oxidation – oxidation limited by storage in a weak acid – and storage at low temperatures – <i>B group vitamins</i> : riboflavin is destroyed by exposure to the light – should be stored in the dark – destroyed by high temperatures – destroyed when cooked in the presence of an alkali – e.g. when bicarbonate of soda is used to improve the colour of green leafy vegetables – folate is destroyed by prolonged heating – nicotinic acid is the most stable of the B group vitamins – resistant to heat – oxidation – alkali –	[5]
(b)	required to make the substance visual purple – formed in the retina – for vision in dim light – needed to keep mucous membranes – in the throat/bronchi – moist and free from infection – needed for the maintenance of healthy skin – required for the normal growth of teeth and bones in children – required for the synthesis of keratin –	[3]
(c)	<i>deficiency</i> : anaemia – low haemoglobin levels/ fewer red blood cells – lethargy – shortness of breath – pale complexion – <i>excess</i> : nausea/ vomiting – diarrhoea – metallic taste in the mouth – intestinal bleeding – dark or black stools/ blood in stools – constipation – poor circulation/ blue lips – dizziness –	[4]
(d)	approx. 70% of the body is water – required for all body fluids – e.g. digestive juices/ mucus/ saliva/ blood/ lymph/ urine/ perspiration – important to keep mucous membranes moist – e.g. digestive tract and bronchial tubes – needed for lubrication of joints – synovial fluid – some nutrients dissolve in water for absorption – needed for the removal of waste as urine – transportation of some nutrients – provides a medium for reactions to take place – in the maintenance of body temperature by sweating – to replace water lost through perspiration – water is a reactant in some metabolic reactions – e.g. hydrolysis of nutrient molecules – needed to prevent constipation – provides a feeling of fullness –	[6]

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(e)	<p><i>symptoms:</i> thirst – headache – tiredness – dry mouth, lips and eyes – concentrated urine – passing small amounts of urine infrequently – loss of performance – heat exhaustion – liver/joint/muscle damage – constipation – kidney stones – sunken eyes – low blood pressure – weak pulse – rapid heartbeat – fits – death –</p> <p><i>most at risk:</i> babies – low body weight/high surface area to volume – loose fluid easily – elderly people – small appetites/drink less – may be less aware of own needs convalescents – raised temperature – causes sweating – people with vomiting or diarrhoea – especially babies – fluid lost in vomit or stool – lactating mothers – for milk production – diabetics – because of frequent urination – sportspeople/after intense physical activity – due to water lost through sweating – people at high altitude –</p>	[7]
4 (a)	<p><i>saturated fat:</i> high in calories – leads to obesity – can cause low self-esteem – bullying – obesity can lead to CHD – where coronary arteries – become blocked – by atheromas – blood cannot easily reach the heart – heart becomes starved of oxygen – blood pressure is raised – heart has to work harder to pump blood – heart attack may occur – may lead to increased cholesterol – linked to the development of CHD – cholesterol can block coronary arteries –</p> <p><i>sucrose:</i> sweet flavour is addictive – leads to overeating – high in calories/kilojoules – empty calories/kilojoules – leads to obesity – calories/kilojoules not burnt in energy expenditure are stored – as adipose tissue – can lead to type two diabetes – as blood sugar level is raised – not enough insulin produced to deal with raised levels – sucrose in the mouth is food for bacteria – acid produced – destroys tooth enamel – leads to dental caries –</p>	[8]
(b)	<p><i>HDL:</i> mops up excess cholesterol in the body – returns it to the liver for re-processing – often called ‘good cholesterol’ – raised levels give protection against heart disease –</p> <p><i>LDL:</i> transports cholesterol from the liver – to be deposited elsewhere in the body – known as ‘bad cholesterol’ – it deposits cholesterol in the lining of your arteries – leads to CHD –</p>	[6]
(c)	<p>fatty acids are part of a fat molecule – with glycerol they make up a molecule of fat – there are many different types of fatty acids – they may be saturated – or unsaturated – depending on their chemical arrangement of carbon and hydrogen atoms – in a saturated fatty acid all the carbon atoms are joined to a hydrogen atom – and cannot accept any more hydrogen atoms – e.g. palmitic acid/stearic acid – in an unsaturated fatty acid a carbon may be joined to another carbon by a double bond – not all the carbons are saturated with hydrogen atoms – e.g. oleic acid – monounsaturated fatty acids have one double bond – polyunsaturated fatty acids have more than one double bond – unsaturated fatty acid are cis or trans – trans fatty acids can accumulate in the coronary arteries –</p>	[6]

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(d)	<p>for an adult: 2–10 g per day / no more than 6 g per day – salt causes hypertension – can lead to CHD – stroke – causes muscle cramps – required by the body for maintenance of correct concentration of cell cytoplasm / water balance –</p> <p>for an infant: no more than 1–2 g per day – damage to the kidneys – smaller body size – kidneys not as effective / not fully developed</p> <p>hot / moist climates may alter these recommendations</p>	[5]
5 (a)	<p>different varieties of wheat grain blended – removal of dirt by washing – grains broken between rollers – crushed grain sieved into – endosperm – bran with attached endosperm – further crushing to remove bran – flour made by passing endosperm through close together rollers – further sieving to remove the germ as a powder –</p> <p>extraction rate: percentage of the wholegrain used in the flour; 100% extraction – wholemeal – all the grain – flour is brown from bran; 85% extraction – wheatmeal – 15% bran removed – brown from remaining bran; 70% extraction – white – most of the bran removed – germ removed;</p>	[4] [4]
(b)	<p>gluten is a protein – used in bread making / cake making – absorbs liquid – promoting stretch – hold pockets of gas – produced by the yeast / raising agent – coagulates – provides a framework –</p>	[3]
(c)	<p>result of moisture loss and – the action of enzymes – very watery vegetables or fruit – e.g. cucumber / melon – continue to respire – after harvesting – moisture is lost – through leaves and skin – moisture is not replaced – vegetable shrinks – its skin wrinkles –</p> <p>enzymes catalyse – the breaking down of tissues – oxidase destroys vitamin C / vitamin A / carotene / vitamin B₁ / thiamine – enzymes cause browning of the flesh – where there is bruising / damage –</p> <p>some enzymes cause ripening – starch in unripe fruit is converted to sugars – to sweeten the fruit – causes browning of the skin – pineapple / bananas –</p> <p>microorganisms may contaminate the food – yeast / bacteria / mould – and reproduce rapidly – ferment – as fruit and vegetables are moist and supply a source of sugar – will cause discoloration and a change in texture and aroma of the food –</p>	[6]
(d)	<p><u>Bacillus cereus</u> cool – dry – to prevent mould; sealed – to prevent attack by insects / weevils; dark – to prevent rancidity of <u>wholemeal</u> flour / rice / pasta;</p>	[4]

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(e)	<p>easy to prepare – do not have to make a breakfast from scratch; appeal to modern lifestyle – people have no time for food preparation due to work; contain a variety of cereals – gives good flavour; textures/mouth feel – as are mixed with dried fruit/chocolate – taste sweet – and can be shredded/rolled/puffed/flaked; provide slow release energy – from starchy carbohydrates; fortified with iron – fortified with B group vitamins; wide variety available – inexpensive – easily available; appeal to children – through advertising;</p>	[4]
6 (a)	<p>all types of vegetarians refuse to eat animal flesh and animal products that mean the death of the animal – lacto vegetarian – allows milk and milk products (but not eggs) – ovo vegetarians – allows eggs – but not milk/milk products – lacto-ovo vegetarians – will eat milk, cheese, eggs –</p> <p>all types of vegetarians may lack HBV protein – may obtain HBV protein by complementation – when two LBV proteins are eaten together so that the EAA/IAA missing in one food is made up in the other – e.g. cereal and pulse/lentil soup and bread/baked beans on toast – cereals lack lysine – pulses lack methionine –</p> <p>all vegetarians may eat soya – HBV protein –only plant source that contains all of the IAA – found as tofu/tempeh/soya milk/soya flour/TVP – all vegetarians may lack iron as it is most plentiful in red meat – need to eat dark green leafy vegetables/cocoa/curry powder – all vegetarians may lack vitamin D – may obtain from sunlight –</p> <p>all types of vegetarian need a variety of foods – to obtain all nutrients – all types of vegetarians should drink approximately two litres of water per day – as their intake of NSP tends to be higher – all vegetarians should cut down on salt – flavour foods with herbs/spices – all types of vegetarians may need to supplement their diets with omega-3 capsules and vitamin B₁₂ –</p> <p>ovo- and lacto-ovo vegetarians may eat mycoprotein –vegans or lacto vegetarians may not eat mycoprotein if bound with egg albumin – lacto and lacto-ovo vegetarians should avoid eating too much hard cheese to get HBV protein – too much saturated fat – lacto and lacto-ovo vegetarians may eat dairy products/margarines/breakfast cereals/soya milk brands which have all been fortified with vitamin D –</p> <p>vegans lack retinol as it is only available from animal sources – can get carotene from fruit and vegetables – body converts carotene to retinol in the gut – six times as much carotene required as retinol –</p>	[12]
(b)	<p>soya beans – are crushed – their oil is extracted – soya flour with the fat removed remains – it is blended – heated under pressure – at 100°C – extruded through a nozzle – into a lower pressure environment – causing it to expand – it is dried – cut into pieces – colours and flavours may be added –</p>	[3]

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(c)	<p>a convenience food – just needs rehydrating/water adding versatile – shaped into chunks/mince – different flavours added – cheap to grow – provides a high yield per acre of land – when compared to farming animals – no waste from production –</p> <p>easy to digest – is low in saturated fat – low in cholesterol – contains all essential amino acids – excluding methionine – high in vitamin B₁₂ – low sodium – high fibre – low calories/kilojoules –</p> <p>cheap to buy – for people on low income –</p>	[5]
(d)	<p>name of product – for identification – the treatment food has had – e.g. UHT milk – so the consumer is aware of processes – may need to consult for religious/personal reasons/AVP – list of ingredients – to identify for allergies –in descending order of weight – to show ratio of quantities – additives – for allergy purposes/AVP – net quantity – so consumer knows how much to buy/for fairness/checking – cooking instructions – health and safety/AVP – storage instructions – for health and safety/AVP – use by date/shelf life – for health and safety/AVP – name and address of manufacturer for complaints/queries – place of origin – for traceability – cost – for budgeting – picture – for personal choice/to appeal – serving suggestion – to encourage purchase – nutritional information – for dietary purposes –</p>	[5]
7 (a)	<p>food needs differ – depending on age – gender – health – daily activity – climate – pregnancy – lactation – likes/dislikes – food customs –</p> <p>how/what food is prepared for a meal depends upon – skill – time available – facilities/cooking methods – availability of foods – budget/income – occasion –</p> <p>food should be colourful – attractively presented – aromatic – eaten at regular times – served in a comfortable environment –</p> <p>meals should include variety – take into account portion size – special food requirements for convalescents/vegetarians/allergy/religion –</p>	[10]
(b)	<p>use of food tables – to calculate mass of fat/nutrients per gram/100g of food – compare to RDI/nutritional guidelines – use of computer databases – calculates results from input of ingredients – named example –</p>	[3]

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(c)	<p><u>minimum rate at which the body uses energy when at rest;</u></p> <p>age – young children need energy for growth; gender – men are larger in body size; physical activity – athletes need more energy than someone watching television; occupation – sedentary workers need less energy than labourers who use a lot of energy; state of health – metabolism may be raised due to fever or lowered due to lack of activity; state of body – pregnant and lactating women need extra energy for growth of fetus and production of milk;</p> <p>BMR/basal metabolic rate – varies with age/old people have lower BMR/men have higher as usually more muscle than women who have more fat; climate – need more energy in cold climate to maintain body temperature;</p> <p>thyroid gland activity – excess thyroid activity increases need for energy/overactive thyroid increases BMR; thermogenic effect of food – intake of food stimulates metabolism/metabolic rate increases after a meal/meal produces extra energy in form of heat; function of glands/internal organs – varies according to health/food intake – personality – calm/placid individuals require less energy than those who are nervous/aggressive;</p>	[8]
(d)	<p>kwashiorkor –fair to normal energy intake –but inadequate protein – body cannot synthesize the proteins it needs – body proteins are broken down to supply the body with energy – associated with oedema/swelling due to fluid retention and hepatomegaly/enlarged liver</p> <p>marasmus – inadequate energy and protein intake –associated with severe wasting/thin limbs/little muscle or fat– apathy – reduced immunity – flaky appearance of skin due to peeling – alternate bands of pigmented and depigmented hair – diarrhoea</p>	[2] [2]
(8) (a)	<p><i>margarine</i>: can be animal fats and oils or vegetable oils – like sunflower/soya – or a blend of oils – oils are refined/cleaned – then hardened – by hydrogenation – by bubbling hydrogen through the oils – in the presence of a nickel catalyst – to speed up the reaction – oils are then deodorised – to remove any free fatty acids – pasteurised milk blended in – mixture is emulsified – with lecithin – add salt/colours – vitamin A and vitamin D added by law – may be texturised by whipping – has at least 80% fat content – can contain only up to 3% milk fat –</p> <p><i>low fat spreads</i>: processed in a similar way to margarine – contain only 40%–80% fat – more water is added – during emulsification – more air is added – to make the spread softer –</p>	[10]

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(b)	65g strong plain flour / plain flour – 50g butter – 150ml water – 2 eggs – sift the flour onto paper – heat fat and water in a pan – bring to the boil – remove pan from heat – tip flour onto hot liquid – beat vigorously with wooden spoon – until smooth – forms a ball in the centre of the pan – heat for 2 minutes mixing constantly – cool for 2 minutes – add in eggs a little at a time and beat – until a piping consistency –	[5]
(c)	emulsifier – to help create an emulsion; stabiliser – to maintain emulsion; flavour enhancer – to replace flavour lost in processing; antioxidant – to prevent oxidative rancidity in any fats; preservative – to increase shelf life – prevent the growth of microorganisms; colourings – to improve the colour – replace colour lost in processing; humectant – to prevent food drying out;	[5]
(d)	sealed plastic container – to prevent entry of microorganisms – vacuum packaged – wrapped in impermeable plastic film – air removed under a vacuum – food spoilage is slowed – prevents entry of microorganisms until seal is broken – modified atmosphere packaging / MAP – food is sealed in a package with an inert gas – carbon dioxide / nitrogen – lack of oxygen – prevents growth of microorganisms –	[5]