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**FOOD STUDIES**

**9336/01**

Paper 1 Theory

**October/November 2016**

MARK SCHEME

Maximum Mark: 100

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**Published**

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<b>Question</b>	<b>Answer</b>	<b>Mark</b>
1(a)	<p><i>calcium:</i> component of bones and teeth; blood clotting; muscle contraction; regular heartbeat; nerve activity;</p> <p><i>phosphorous:</i> component of bones and teeth; energy storage and transfer; cell division; reproduction; component of ATP /adenosine triphosphate; for energy release; helps to metabolise fats and proteins; helps to keep blood pH neutral;</p> <p><i>iodine:</i> component of thyroid hormones /thyroxine; controls rate of metabolism; brain development in the <u>unborn child</u>;</p>	<p><b>2</b></p> <p><b>2</b></p> <p><b>2</b></p>
1(b)	<p><i>cobalt:</i> component of B<sub>12</sub>; for red blood cell production; prevents pernicious anaemia; important in normal nervous system function;</p> <p><i>copper:</i> cofactor which combines with proteins; to produce enzymes that are catalysts in chemical reactions; helps produce red and white blood cells; triggers the release of iron; to form haemoglobin; helps to make collagen; acts as an antioxidant;</p> <p><i>manganese:</i> antioxidant; activates enzymes; needed to digest and synthesise fatty acids and cholesterol; metabolise carbohydrates and proteins; important for energy production; activates enzymes that enable the other key nutrients to be used; for normal bone and cartilage growth; keeps bones strong and healthy; needed for collagen formation in skin cells which is required for healing of wounds; component of metalloenzymes; to synthesise glutamine and in glucose metabolism; helps regulate blood sugar levels; required for the production of sex hormones /fertility; required for lactation; maintains healthy nerves; supports optimal function of the thyroid gland and thyroxine production; essential for proper iron metabolism; helps prevent anaemia;</p> <p><i>zinc:</i> makes new cells and enzymes; helps to process protein, carbohydrates and fat; helps to heal wounds;</p>	<p><b>2</b></p> <p><b>2</b></p> <p><b>2</b></p> <p><b>2</b></p>

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<b>Question</b>	<b>Answer</b>	<b>Mark</b>
1(c)	<p><i>cobalt</i>: liver / fish / nuts / green / leafy vegetables / cereals /</p> <p><i>copper</i>: green vegetables / fish / liver /</p> <p><i>manganese</i>: tea / cereals / pulses / nuts /</p> <p><i>zinc</i>: meat / meat products / milk / cheese / bread flour / cereals /</p>	<b>2</b>
1(d)	<p>vitamin A; vitamin D; riboflavin / B<sub>2</sub>; thiamine / B<sub>1</sub>; ascorbic acid / vitamin C; niacin / B<sub>3</sub>;</p> <p>cows eating grass in the summer months – affects vitamin A content;</p> <p>cow's exposure to sun in the summer months – affects vitamin D content;</p> <p>heat treatment / sterilisation / pasteurisation – destroys thiamine / B<sub>1</sub> / ascorbic acid / vitamin C;</p> <p>exposure to light – destroys ascorbic acid / vitamin C / riboflavin / B<sub>2</sub>;</p>	<b>4</b>
1(e)	<p>absorbs water in the colon; makes the faeces soft; makes faeces bulky / making it easy to expel;</p> <p>helps to minimise constipation / diverticular disease; provides fuel for bacterial metabolism;</p> <p>increases colonic bacterial mass; lowers pH; increases bowel mobility / transit time for a typical diet may be 100 h but just 35 h with high NSP; binds the food residues / stimulates peristalsis / gives the muscles something to grip on to; helps to remove toxins / reduces the incidence of colonic cancer;</p> <p>helps to lower blood cholesterol; can help in slimming diets as it gives a feeling of fullness / prevents overeating; (diets rich in <i>soluble</i> NSP) slow down the release of glucose to the blood / lower blood glucose levels;</p>	<b>5</b>

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<b>Question</b>	<b>Answer</b>	<b>Mark</b>
2(a)	17 kJ / 4 kcal	<b>1</b>
2(b)	<p><i>primary structure:</i> made up of connected units / of amino acids; that are held together by peptide / amide bonds; formed in a condensation reaction / water is eliminated; small peptide chains formed / two amino acids is a dipeptide / three amino acids is a tripeptide; form a polypeptide chain / in a particular sequence; simple structure;</p> <p><i>secondary structure:</i> created as primary structure is folded; to form <u>alpha</u> helix; to form <u>beta</u> pleated sheet; cross-links form between (poly)peptide chains; form between R groups; disulfide bridge / covalent bond; between cysteine units; weaker hydrogen bonds; between hydrogen and oxygen atoms;</p>	<b>3</b>  <b>3</b>
2(c)	<p>tertiary structure drawn; compact; spherical; randomly coiled; albumin / ovalbumin / lactalbumin / egg white; soluble in water and dilute salt solutions; coagulated by heat; globulin / blood / casein / milk / lactoglobulin; insoluble in water; dissolves in electrolyte solution; coagulates on heating;</p>	<b>5</b>



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<b>Question</b>	<b>Answer</b>	<b>Mark</b>
2(f)	individual receives fair to normal energy intake but inadequate protein; body cannot synthesise 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; retarded growth <u>in children</u> ;	<b>2</b>

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<b>Question</b>	<b>Answer</b>	<b>Mark</b>
3(a)(i)	disaccharide; with the chemical formula $C_{12}H_{22}O_{11}$ ; made up of one unit of glucose and one unit of galactose; both are monosaccharides; joined in a condensation reaction where a molecule of water is eliminated; $(C_6H_{11}O_5) - O - (C_6H_{11}O_5) + H_2O$ ;	<b>3</b>
3(a)(ii)	<i>enzymic hydrolysis</i> : occurs during digestion; a hydrolase / hydrolysing enzyme; catalyses the hydrolysis; water is present to split up a molecule into two smaller molecules; lactase catalyses the hydrolysis of lactose; into glucose and galactose;  <i>defective absorption (malabsorption)</i> : known as lactose intolerance; lactase is insufficiently manufactured by the body; lactose remains in the stomach / lactose is not digested; and is fermented by bacteria causing bloating;	<b>3</b>  <b>3</b>
3(b)(i)	HDL transports unneeded cholesterol back to the liver; to be broken down or eliminated as waste; LDL is a cholesterol transporter that carries cholesterol to body cells; to make up the membrane of body cells / insulate nerve fibres / make hormones / make bile acids to digest and absorb fats;	<b>3</b>
3(b)(ii)	villi absorb nutrients from digested food; to be passed into the bloodstream; they are tiny finger like projections; increase the surface area of the ileum; each villus has an outer membrane; through which nutrients pass to reach the centre; at the centre is the lacteal / lymph vessel which is connected to the lymphatic system; the lacteal is surrounded by tiny blood capillaries that are connected to larger blood vessels;	<b>5</b>

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3(b)(iii)	salivary amylase in the mouth; converts some starch to maltose; pancreatic amylase; in the duodenum; breaks down undigested starch to maltose; maltase in the ileum; breaks down maltose to glucose; invertase breaks down sucrose; to glucose and fructose; lactase breaks down lactose; to glucose and galactose;	<b>4</b>
3(b)(iv)	also known as amino transfer; is a reduction reaction; which occurs in the liver; where an amino group is transferred from an amino acid; to an $\alpha$ -keto acid; to form a new amino acid; or the reverse / to degrade an amino acid; without forming toxic ammonia;	<b>4</b>

<b>Question</b>	<b>Answer</b>	<b>Mark</b>
4(a)(i)	(mechanical energy) for the movement of muscles; (chemical energy) for metabolic reactions; (heat energy) to maintain body temperature; (electrical energy) to transmit nerve impulses;	<b>1</b> <b>1</b> <b>1</b> <b>1</b>
4(a)(ii)	excess glucose; is stored in the liver and the skeletal muscles; in a form called glycogen; to be used when the body needs more glucose than is readily available in the bloodstream; for example during exercise; the body has limited storage capacity for glycogen; about 8400 kJ / 2000 calories; if glycogen stores are full glucose is stored as fat;	<b>4</b>
4(a)(iii)	also known as non-enzymatic browning; occurs when a food containing protein and carbohydrate, e.g. biscuits; are exposed to dry heat / baking; a reaction occurs between the amino group in the protein; and the aldehyde group of a reducing sugar; producing melanoidins; that give a browned <u>surface</u> to the food and a pleasant aroma; the reaction is slowed by the presence of an acid and proceeds more rapidly in alkaline conditions;	<b>5</b>



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4(a)(iv)	in apples / avocado / bananas / potatoes / peaches / pears; damaged / cut cells release phenols; which in the presence of the enzyme <u>phenolase</u> ; act as a substrate to the enzymes; allowing the <u>phenolase</u> to turn the phenols into a new product; called melanin; in the presence of oxygen;	<b>3</b>
4(b)	growth and development rapid; calcium / vitamin D / phosphorus for growth of bones and teeth; demand for energy and all nutrients is high; in excess of 8400 kJ / 2000 calories per day between the ages of 11 and 18; demand for iron increases for muscle development; more iron for girls because of menstruation; RNI iron for girls is 14.8 mg and RNI for boys is 11.3 mg; vitamin C needed for absorption of iron; more calcium required due to increased bone mass; eat more fruit and vegetables to provide vitamins and minerals and keep skin healthy; avoid fatty foods as these aggravate skin conditions; increased protein for rapid growth; avoid junk food as they contain empty calories; increase weight and provide little nutrition; but filling so proper meal not eaten at mealtimes; ensure hydration through water and milk and avoid alcohol – linked to adolescent lifestyle;	<b>9</b>

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Question	Answer	Mark
5(a)(i)	untreated milk may contain <i>tuberculosis</i> / <i>Brucella</i> or other pathogens; heating kills these bacteria; to make milk safe for human consumption; to extend shelf life by delaying the souring process;	2
5(a)(ii)	<p>pasteurisation; is where milk is heated to above 72 °C for at least 15 seconds; then cooled quickly to below 10 °C; known as the flash process; Holder method of pasteurisation requires heating for 30 min at 63 °C;</p> <p>sterilisation; requires homogenised milk to be bottled and sealed; before being heated in an autoclave to 113 °C for 15 to 40 min; the milk will keep longer than pasteurised milk if unopened;</p> <p>UHT milk; is heated in a heat exchanger; at 132 °C for 1 second; then quickly cooled; will keep for months if unopened;</p> <p>condensed milk; milk is homogenised and heated to 80 °C for 15 min; sugar is added and the milk is heated under a vacuum; until enough liquid has evaporated to make the milk 22 times more concentrated than fresh milk;</p> <p>evaporated milk; milk is homogenised and heated to 80 °C for 15 min; milk is heated under a vacuum; until enough liquid is evaporated to make the milk twice as concentrated as fresh milk; the milk is canned and then sterilised for 20 min at 115 °C;</p> <p>dried milk; milk is homogenised and heat treated; milk is sprayed through a jet into a chamber where hot air is circulating; water evaporates and the milk falls to the bottom of the chamber as a powder;</p>	9

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<b>Question</b>	<b>Answer</b>	<b>Mark</b>
5(b)	milk is pasteurised and pumped into vats; starter culture added and lactose is converted to lactic acid ; milk is heated to 30 °C; rennet is added to clot the milk; caseinogens coagulate; left for 1 hour and curd and whey forms; whey is drained off; curd is heated to 40 °C for 45 min to remove further whey; whey is drained off; curd is cut into blocks and blocks are stacked on top of each other; known as cheddaring; salt is added; curd is packed into metal moulds and pressed; sprayed with hot water to form a rind; removed from the mould and left to ripen; at 10 °C for 4 months;	<b>7</b>
5(c)	stabiliser like agar / gelatine / pectin to prevent the yoghurt from separating into curds and whey; thickener like milk protein or starches to achieve a Greek yoghurt style / improve mouth feel; flavouring like citric acid may be added for a tangy flavour; colouring to increase intensity of colour, e.g. carmine for strawberry and raspberry flavours / beetroot for blueberry flavours; sweetener like sugar / sugar substitutes added; preservatives like antioxidants may be added to inhibit the action of enzymes and prevent destruction of vitamin A and vitamin C; emulsifier like lecithin from the soya bean may be added to create a stable oil-in-water emulsion;	<b>7</b>

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6(a)	100 g plain flour, 275 ml of milk, 1 egg, ½ tsp salt; sieve flour and salt make a well in the centre; add the egg, add some liquid, mix into the flour; add remaining liquid, mix until smooth, beat for 5 min, fry in a shallow amount of butter / oil;	<b>4</b>
6(b)	any leavened bread or cake mixture; yeast will produce carbon dioxide and alcohol; during fermentation; yeast requires a food source / sugar, a warm temperature / 25–29 °C, moisture, time to ferment, and enzymes; during fermentation maltase converts maltose to glucose; invertase converts sucrose to fructose and glucose; zymase converts glucose and fructose to carbon dioxide and ethanol; gas expands in the oven and raises the dough mixture; expansion stops when yeast is killed at high temperature;	<b>6</b>
6(c)	<i>choosing:</i> fish is displayed on ice; shellfish should be firmly closed; look for bright eyes, not sunken; firm flesh and moist skin; bright scales that are firmly attached scales; fresh / sea smell; bright red gills, not sunken;  <i>storage:</i> fish decays rapidly so eat or freeze on day of purchase; store wrapped; in a fridge / 5 °C; can be frozen on day of purchase and if not previously frozen;	<b>7</b>

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<b>Question</b>	<b>Answer</b>	<b>Mark</b>
6(d)	<p>kitchen should be arranged in a logical order to form a continuous working area for meal preparation; this will save time and avoid wasting energy; user should be able to move easily from food storage, to preparation area, to cooking area, to serving area, to cleaning area; the L-shaped kitchen, U-shaped kitchen or kitchen planned in parallel lines achieves this efficiency; credit the work triangle; maximise use of corner space with corner units and wall units for storage;</p> <p>waste bin can be stored under the sink to use less floor space; a lid should be fitted to deter flies; bin should be small to facilitate regular emptying and to prevent the accumulation of odours and bacteria;</p> <p>flooring should be non-slip, easy to clean and not damaged to prevent trips;</p> <p>lighting should be adequate so the user can see clearly to facilitate cleaning, window provides daylight and ventilation;</p> <p>window dressing / curtains should not flap near cooker where they are a fire hazard;</p> <p>all surfaces should be easy to clean and smooth being made from washable, non-porous, non-toxic materials; e.g. stainless steel / food grade plastics; cleaning fluids and other kitchen chemicals should be correctly labelled and should be stored in a high up cupboard, or a locked cupboard where children cannot gain access; surfaces should be cleaned before and after food preparation, spills should be wiped up immediately to prevent slippage; floors should be swept;</p> <p>food should be stored appropriately, high risk foods in the fridge, dried foods / packets should be in a dry cupboard; animals should be kept out of the kitchen; knives should be stored with blade down / in a knife block and away from children; electrical equipment should not be used near the sink area and should be thrown away if faulty / wires bare;</p>	<b>8</b>

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Question	Answer	Mark
7(a)	bacteria and spores present in soil; spores reproduce and release toxins; spores can survive normal cooking temperatures; spores reproduce particularly at pH 7; and in the absence of oxygen; ripe tomatoes are not acidic / are near pH 7; environment in tomato is low oxygen, so conditions hospitable for bacterial growth;	3
7(b)	<p><i>dehydration:</i> removes moisture from the food; and increases the concentration of sugars and salts to inhibit microbial growth; e.g. milk powder;</p> <p><i>freezing:</i> stops bacterial growth; and enzyme activity, e.g. ice cream;</p> <p><i>antioxidants:</i> are additives that will prevent fat rancidity and food browning; and the destruction of vitamins A and C, e.g. sulfur dioxide used in dried fruits;</p>	6
7(c)	<p>red kidney beans; should be soaked for 5 hours then boiled;</p> <p>green potatoes; should be discarded;</p> <p>cashew nuts / almonds; should be steamed / heated as they contain cyanide;</p> <p>cassava is also cyanogenic; must be peeled, grated and soaked in water before boiling;</p> <p>mushrooms must be precisely identified; should not be eaten if there is uncertainty of the type;</p> <p>rhubarb leaves are toxic; should be discarded;</p>	4

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Question	Answer	Mark
7(d)	<p>food poisoning result of physical, biological and chemical contaminants;</p> <p><i>physical hazards can be eliminated/reduced:</i> through removal of jewellery, covering of head /facial hair, wearing blue plasters and removing nail varnish; there should be no smoking; checks of equipment should be made to see that it is intact; checks should be made to see that egg shells do not fall into mixtures; insects should be prevented from entering the kitchen;</p> <p><i>chemical hazards can be eliminated/reduced:</i> through correct storage of bleaches / cleaning fluids and correct training in the use of cleaning fluids, to include rinsing soap off hands thoroughly and rinsing work surfaces / ovens after cleaning with disinfectants; the use of insect sprays should be avoided;</p> <p><i>biological hazards can be eliminated/reduced:</i> through cleaning hands with soap before cooking / after using the toilet / after sneezing; fingers should not be licked; food preparation / cooking should be avoided when ill; fingernails should be short; clean apron / overalls should be worn; work surfaces should be cleaned regularly; equipment should be cleaned after use; bins should be covered and emptied regularly; high risk foods should be stored below 5 °C; fridge / freezer temperatures should be monitored; frozen food should be thawed thoroughly before reheating; cooked foods should be stored away from raw foods; use-by dates should be checked; stock should be rotated; dented cans should be discarded; training should be given in the use of appropriately colour-coded chopping boards; a food probe should be used to check cooking temperatures reach above 72 °C;</p>	12

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8(a)	<p>needs of all family members must be met; variety of foods should be eaten each week; avoid fast foods/foods that are high in fats/sugars/salt; they are costly and not filling for long; oily fish provide omega oils; tinned versions may be cheaper than fresh in some countries, e.g. sardines/ anchovies/ mackerel;</p> <p>cheap cuts of red meat/offal are still nutritious and protein-rich; need cooking for longer/braising; chicken is a cheap protein – legs/wings/feet, not breast, or buy whole bird and make multiple meals from it;</p> <p>minced meat is cheaper than steaks/chops but should only be eaten occasionally as it can be fatty; soya/tofu are protein rich and cheaper than meat;</p> <p>local fish that is abundant is cheaper than imported fish;</p> <p>eggs are nutritious/protein-rich and versatile so are useful in many dishes;</p> <p>staple foods like rice/semolina/pasta/noodles/maize/cassava are filling and provide carbohydrate/energy;</p> <p>local fruits and vegetables provide vitamins and minerals and should be eaten in at least five portions per day; they are cheaper than imported fruits and vegetables;</p> <p>avoid processed foods that have added salt and high fat and are costly, e.g. fish fingers/frozen pies;</p> <p>avoid alcohol/fizzy drinks/sodas, and drink water and milk;</p>	9
8(b)	<p>size and capacity required, under counter/tall; storage arrangements inside the refrigerator, shelving, freezer at top or bottom; space available in the kitchen; star rating for frozen food compartment; practicability of a larger fridge; budget available; energy rating; brand loyalty/manufacturer preference; colour and style, American fridge; ratings and reviews/blogs; special features, water dispenser, ice dispenser, wine racks; automatic defrosting; quality and after service available; easy to clean</p>	8



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8(c)	<p>can be used to reheat precooked food, cook foods from raw, defrost frozen foods, soften / melt butter / jelly cubes;</p> <p>choose cake recipes that use a dark coloured ingredient as cakes do not brown or use a browning dish to brown food;</p> <p>no metal dishes and no aluminium foil as it may cause damage to the oven; check that plastic containers are microwave friendly; cover the food during cooking to avoid drying out; use food safe cling film to avoid chemical transfer into the food;</p> <p>know the heating category of the microwave being used and read the packaging carefully selecting the appropriate amount of time to cook foods for; stir foods half way through cooking and check temperature of the food is over 72 °C after cooking; time carefully to avoid overcooking / burning;</p> <p>do not cook eggs in their shell as they will explode;</p> <p>do not cook any food in a membrane or skin, e.g. potato needs to be pricked to allow steam to escape;</p> <p>avoid excessively fatty foods;</p> <p>allow 10% standing time after cooking before consuming the food;</p> <p>read the instruction booklet;</p> <p>clean between uses, especially on the ceiling of the microwave;</p>	<b>8</b>