Cambridge Assessment International Education

Cambridge International A Level

FOOD STUDIES **9336/01**

Paper 1 Theory **October/November 2023**

MARK SCHEME

Maximum Mark: 100

Published

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 International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

PUBLISHED

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Science-Specific Marking Principles

1	Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
2	The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
3	Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
4	The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.
5	‘List rule’ guidance For questions that require ***n*** responses (e.g. State **two** reasons …): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked *ignore* in the mark scheme should not count towards ***n***. • Incorrect responses should not be awarded credit but will still count towards ***n***. • Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response. • Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

SECTION A

Question	Answer	Marks
1(a)	*digestion in mouth* no chemical breakdown of fat AND no chemical breakdown of protein; *digestion in the stomach* no chemical breakdown of fat; pepsin breaks down protein molecules into smaller chains of amino acids; called peptides / smaller polypeptides / peptone; rennin clots milk proteins in cheese so that pepsin can work better; *digestion in the ileum* fats broken down by lipase; erepsin converts peptones; to amino acids;	**8**
1(b)	(secondary and tertiary proteins) are created through folding; the secondary structure refers to regular, repeated patterns; of the folding of the protein backbone / primary protein / chain of amino acids; where α-helix and β-pleated sheets are formed; the structure is held together by hydrogen bonds; the overall three-dimensional **structure** of a polypeptide is called its **tertiary structure**; the **tertiary structure** is primarily due to bonds that form between the R groups of the amino acids;	**5**
1(c)(i)	the body is unable to synthesise the amino acid and it must therefore be acquired from foods;	**1**
1(c)(ii)	people with phenylketonuria / PKU; do not produce the enzyme required / phenylalanine hydroxylase to break down phenylalanine; into tyrosine; so phenylalynine builds up in their blood stream and brain; leading to brain / organ damage;	**3**

Question	Answer	Marks
1(c)(iii)	aspartame; meat; fish; poultry; dairy; soya; legumes; nuts; eggs;	**1**
1(d)	liver is a storage organ for vitamins; B-vitamins are water soluble and are therefore stored for short periods; vitamins A, D, E and K; accumulate in the liver; because they are insoluble in water / fat soluble; are not excreted in the urine;	**3**
1(e)	(i) vitamin C/ vitamin D/ calcium; (ii) vitamin D/ vitamin A; (iii) iron/ thiamine/ niacin/ folate/ B12; (iv) calcium/ folate/ niacin/ thiamine/ iron;	**2**
1(f)	these foods lose nutrients during processing; these foods are eaten regularly / daily; and that ensures that the desired nutrients are provided regularly to the body; it would be less effective to fortify other foods that are not eaten regularly as the desired nutrients might never be eaten;	**2**

Question	Answer	Marks
2(a)	sucrose; is a disaccharide; containing the elements carbon, hydrogen and oxygen; with a formula of $C_{12}H_{22}O_{11}$; made up of one unit of glucose and one unit of fructose; suitable diagram to show the above features;	**6**
2(b)	(i) / (ii) glucose / galactose; (iii) lactase;	**2**
2(c)	**cellulose** can be <u>fermented</u>; by bacteria; in the small intestine, yielding some energy;	**2**
2(d)	reduction in saturated fat – to prevent CHD; reduction in sugar – to prevent tooth decay / obesity / type 2 diabetes; reduction in salt – to prevent hypertension; increase soluble NSP – to reduce cholesterol / blood sugar OR increase satiety OR reduction in bowel disease; increase non-soluble / insoluble NSP – to aid peristalsis / prevent constipation; increase in water – to aid peristalsis / prevent constipation / obtain hydration; one portion of oily fish per week – to provide omega 3 fatty acids; minimum of 5 portions of fruit and vegetable per day – to provide antioxidants / NSP / vitamins and minerals;	**4**
2(e)(i)	diagram of villus showing correct shape; three features of the diagram labelled correctly;;; (e.g. villus, lacteal, blood capillaries, intestine wall, digested food, microvilli)	**4**

Question	Answer	Marks
2(e)(ii)	meat; milk; Marmite; red salmon; cod; cheese; eggs; fortified breakfast cereal / other fortified product; AVP;	**1**
2(f)(i)	folate / B9; B12;	**1**
2(f)(ii)	large; abnormally developed; red blood cell;	**2**
2(g)	RDI are set to ensure that the needs of those with very high needs are met; on the understanding that a modest excess of intake; would not present a hazard to people with lower needs; this is not the case with energy RDI where intake is individual; if weight gain / loss is to be avoided;	**3**

Question	Answer	Marks
3(a)(i)	*(hypertension is)* a condition that arises when the blood pressure is abnormally high; it occurs when the body's smaller blood vessels / arterioles narrow; causing the blood to exert excessive pressure against the vessel walls; forcing the heart to work harder to maintain the pressure;	**3**
3(a)(ii)	headache; anxiety; shortness of breath; nosebleeds; pulsating neck / head veins;	**1**

Question	Answer	Marks
3(a)(iii)	salty foods; alcohol; caffeine;	**1**
3(b)	(fruits and vegetables) contain stanols and sterols; that reduce the absorption of cholesterol in the intestines; so that more cholesterol is excreted as faeces; this reduces LDL cholesterol in the blood; (eating more fruits and vegetables) may help a person to cut back on eating more high fat foods; reducing the amount of fat in the coronary arteries; (fruits and vegetables) contain antioxidants; vitamin C / beta-carotene / vitamin E; that prevent damage from free radicals; decreasing the risk of blocked coronary arteries; (fruits and vegetables) contain soluble NSP; that reduces LDL in the bloodstream; and improves insulin resistance;	**9**
3(c)	works with iron to form red blood cells; aids iron absorption; needed for the healthy functioning of blood vessels / nerves / bones / immune system;	**2**
3(d)	kcal / 100 g OR kJ / 100 g;	**1**
3(e)(i)	oxalic acid; binds with calcium; to form insoluble calcium oxalate; that is too large a molecule to be absorbed into the bloodstream; phytic acid; binds with zinc / iron / magnesium; to form phytates; that are insoluble;	**6**
3(e)(ii)	(oxalic acid): rhubarb stems / unripe tomatoes / unripe strawberries; (phytic acid): whole-wheat bread / beans / nuts / seeds;	**2**

Question	Answer	Marks
4(a)	*similarities:* tiny globules of these fats are suspended in water; to form a water in oil emulsion; *differences:* (butter) is made up of saturated fatty acids; including palmitic / oleic / butyric / myristic / stearic; that form a mixture of triglycerides; fatty acids are in cis formation; (margarine) is made up of a blend of mostly polyunsaturated triglycerides; some solid and some liquid; different melting temperatures; the oils are hydrogenated; fatty acids are in trans; and cis formation;	**8**
4(b)(i)	*adults:* 30 g per day; *children under 10 years:* 20 g per day;	**2**
4(b)(ii)	*adults:* 1600 mg per day; *children under 10 years:* 1200 mg per day;	**2**
4(c)	*how:* occurs as a reduction reaction; in the mitochondria of the liver cells; where an amino group of an amino acid is transferred; to an acceptor alpha keto acid; without forming toxic ammonia; *why:* (transamination) occurs to form a new non-essential amino acid; or to degrade an amino acid;	**5**

Question	Answer	Marks
4(d)	glycolysis is the process that converts glucose; $C_6H_{12}O_6$; by the action of enzymes / NADH; to release energy; in cellular respiration; and pyruvate / CH_3COCOO^-/pyruvic acid; and a hydrogen ion / H^+;	**4**
4(e)(i)	water intoxication can occur; whereby the kidneys are unable to excrete the excess water fast enough; as they have a limit of 1–2 litres per hour; excess water build up in the brain / cerebral oedema; and the person will become confused / unsteady / vomit / fit / go into a coma;	**3**
4(e)(ii)	an aspect of homeostasis where water intake and water loss are equal;	**1**

SECTION B

Question	Answer	Marks
5(a)	beef doesn't carry many pathogens; as the flesh is very dense and pathogens cannot penetrate and infect the meat; but some pathogens may be on the surface; so flash frying is advised to kill these surface pathogens; sausages and burgers are made of minced / ground meat; often from pigs; that may contain tapeworm cysts; minced meat has to pass through a mincer that may have residue meat/bacteria from previous mincing; minced meat is made from parts of an animal that are more heavily laden with pathogens; like parts of the animal's intestines; thorough cooking to ⩾75 °C destroys the pathogens/cysts in sausage/burger;	**6**
5(b)	meat from bovines – e.g. beef / veal / bison; meat from ovines – e.g. lamb / mutton; meat from swine – e.g. pork / boar; meat from poultry – e.g. turkey / chicken; meat from game – e.g. rabbit / venison;	**3**
5(c)	the importing country is dependent on other countries' political and economic stability; if a trade embargo is placed on the importing country people could starve; reduced trade for other reason e.g. lockdown; the importing country will have a low GDP; limited job opportunities and low wages; if a country imports more than it exports it runs a trade deficit; countries with high import levels must increase their foreign currency reserves to pay for the imports; this weakens the domestic currency value; importing countries have little competitive advantage; fresh fruits and vegetables travelling very far may be nutritionally deficient; AVP;	**4**

Question	Answer	Marks
5(d)	buttered syrup; fruit juice concentrate; molasses; dextrose; cane-juice crystals; refiner's syrup; caramel; golden syrup; sorbitol; honey; carob syrup; mannitol; sorghum syrup; corn syrup; maltodextrin; dextran; malt syrup; glucose; glucose syrup;	**2**

Question	Answer	Marks
5(e)	serve small portions as appetite reduces with age; remove bones/skin etc. as poor eyesight may prevent the person noticing; may need to cut into small pieces or mince food if the person has few teeth; may need soft foods that are easier to digest / chew; fewer carbohydrate foods are needed as the person is less active; a good amount of protein foods are needed to repair worn out cells / maintain muscle mass; increased iron intake needed to prevent anaemia; increased Vitamin C intake to absorb iron; increased calcium / phosphorus intake to maintain bones / teeth / for blood clotting / for muscle function / for nerve function; increased Vitamin D intake to absorb calcium / avert depression; reduce saturated fatty foods as they are difficult to digest / increase risk of CHD / cause obesity / elderly need less energy / have a sedentary lifestyle; reduce salt intake to reduce the risk of hypertension; reduce sugar intake to prevent tooth decay / obesity / diabetes; increase intake of NSP to reduce risk of constipation; variety of colour / flavour / texture to add interest / make more appetising; reduced use of spices / strong flavours as less easily tolerated; water to help prevent constipation; AVP;	**6**
5(f)	transmission of zoonotic diseases; leptospirosis / Weil's disease from rodent urine; Salmonella / campylobacter from bird urine; campylobacter from rats; Avian flu/H5N1 from birds; ingesting dead insects in grain can trigger allergic reactions; insects can carry harmful parasites; some beetles are toxic; insects are often covered in large amounts of pesticides / herbicides / fungicides;	**4**

Question	Answer	Marks
6(a)	*advantages*: food stored between 1–5 °C so bacterial growth is slowed; most homes have a fridge; can refrigerate leftovers; shelving allows storage of a large quantity of food at one time; different areas of fridge help to preserve different types of food – crisper tray for salad; excellent for extending shelf life; *disadvantages*: can only store foods for short periods / a few days; can't store an autumn harvest until the following spring; fridge does not improve aesthetics / flavour / colour of foods; fridge does not add nutrients; microorganisms are not killed and will multiply when food is removed from fridge; food is not sealed in the fridge; fridge can make some foods dry out, e.g. bread; syneresis not prevented by refrigeration; flavours and smells of different foods can merge and some food can taste tainted; some foods cannot be stored in the fridge, e.g. bananas as they go brown quickly; foods are so cold that their flavour is temporarily inhibited; expensive to run; initial cost of fridge high; fridge is not portable so food must remain in the home or workplace; environmental cost; AVP;	**8**
6(b)(i)	addition of a chemical preservative – pickled cabbage / salted beef / strawberry jam; irradiation – coffee beans / potatoes; heating – canned peas / pasteurised milk; removal of air – vacuum packed bacon / packet of crisps;	**3**
6(b)(ii)	(tomatoes contain) glucose and fructose; removing water from the tomatoes; concentrates the sugars and calories into a much smaller package;	**2**

Question	Answer	Marks
6(c)	*(Bacillus cereus)* is a gram-positive; rod-shaped / bacilli; anaerobic; motile; beta-hemolytic; spore forming bacteria; produces enterotoxins / exotoxins; that are highly resistant to heat and acids; and damage the cells of the intestinal wall;	**5**
6(d)	light can cause photodegradation; to pigments / fats / vitamins / proteins; resulting in discoloration / off flavours / vitamin losses; in most solid foods photodegradation only occurs on the surface as the light cannot penetrate deeper; milk loses Vitamin A; potatoes go green / produce a toxin / solanine / grow eyes / chit; oils go rancid; blue light causes a change in flavour to some beers; AVP; 2 marks for description of light causing decomposition and 2 marks for two foods with how they are damaged	**4**
6(e)	*ascorbic acid:* preservative / antioxidant; *sodium benzoate:* preservative / antifungal agent / flavour enhancer; *soy lecithin:* emulsifier;	**3**

Question	Answer	Marks
7(a)(i)	recent health scares like BSE / bird flu etc. – illness could affect the health of the fetus; cooked and raw meat products are often the cause of food poisoning / campylobacter / salmonella / e-coli – want to avoid vomiting and diarrhoea during pregnancy; should avoid meat pate as it can contain listeria – can cause miscarriage; shark meat / marlin / swordfish / excess tuna can contain mercury – can damage fetus' nervous system; cold cured meats / salami / Parma ham / chorizo / pepperoni – may harbour listeria / toxoplasma parasite – that cause miscarriage; sushi fish may contain small parasitic worms – lead to diarrhoea in mother; raw shellfish can contain bacteria and viruses – harm fetus;	**3**
7(a)(ii)	iron to produce all the blood needed to supply nutrition to the placenta and prevent anaemia; vitamin C to absorb the increased iron; vitamin B9 / folic acid / folate to prevent spina bifida / develop central nervous system; essential fatty acids / linoleic acid / linolenic acid to aid fetal brain growth; vitamin D to prevent low birth weight in the baby and osteomalacia in the mother; vitamin B_{12} as the fetus stores the mother's B_{12} supply to use in first sixth months after birth; calcium as the fetus may use calcium from mother's skeleton to supply its own skeleton; protein for fetal growth;	**6**
7(b)(i)	(prebiotic foods) are foods that support the growth of probiotic / good bacteria; in the intestines; allowing the probiotics to flourish and eliminate harmful bacteria;	**2**

Question	Answer	Marks
7(b)(ii)	artichoke; asparagus; endive; green bananas; Jerusalem artichoke; garlic; onion; parsnip; black salsify; wholegrain wheat; rye; oats; leek; AVP;	**2**
7(c)	(i) 50 g; (ii) 150 g; (iii) 50 g;	**3**
7(d)(i)	frozen foods ready to eat on thawing – e.g. peeled, cooked prawns; frozen foods ready to cook – e.g. raw sausage rolls / raw fish in sauce; frozen foods cooked and ready to reheat – e.g. lasagne; frozen foods ready to eat on removal from freezer – e.g. ice cream;	**2**
7(d)(ii)	dehydrated instant food to reconstitute quickly with water – e.g. custard / mashed potato; dehydrated foods to reconstitute with water and cook – e.g. TVP / custard / soup; dehydrated packet mix requiring additional ingredients and liquid – e.g. bread mix / cheesecake mix;	**2**

Question	Answer	Marks
7(e)	*stainless steel* *pros*: recyclable; shiny surface difficult for microorganisms to breed on; easy to clean; heat resistant; rust resistant; *cons*: expensive; industrial aesthetics; finite material; scratch easily; dent easily; *wood* *pros*: biodegradable; sustainable material; good aesthetics; *cons*: stains; cracks and microbes live in cracks; difficult to clean; has to be maintained with oils; scorches; dents easily; expensive; deforestation; *food grade plastics* *pros*: available in different colours / patterns; cheaper than other materials; durable; non scratch; easy to clean; *cons:* non-sustainable material; *granite* *pros*: good aesthetics; easy to clean; heat resistant; scratch resistant; chemical resistant; *cons:* expensive; non sustainable material; porous / can stain; needs sealer / maintenance; AVP;	**5**

Question	Answer	Marks
8(a)	(i) 50 g; (ii) milk;	**1**
8(b)	heat fat – it melts and absorbs flour; add flour and stir – starch granules evenly distributed; heat gently for 1 minute – starch granules soften and form roux; remove from heat and gradually add milk – to form smooth paste / lumps form if added too quickly; return to heat and stir constantly – starch distributed and avoid sticking to pan; bring to boil – starch granules burst / gelatinise; cook for 2 minutes – to remove the floury flavour; remove from heat and add in grated cheese immediately – to avoid overcooking the cheese protein;	**5**

Question	Answer	Marks
8(c)	the process of kneading the dough helps to evenly distribute the ingredients; and incorporate air; which assists in making the bread a light texture; kneading develops gluten; which is necessary for the bread to expand without bursting / expand too much; kneading develops an elastic dough that can capture the gases created by the yeast; the dough stretches as bubbles form; the elasticity gives the bread an open texture;	**5**
8(d)	(i) glucose; (ii) CO_2 **and** alcohol;	**2**
8(e)	dough rises quickly at first as CO_2 expands; yeast ferments more rapidly at first but declines as temperature rises due to yeast being damaged by heat; at 55 °C fermentation ends as the yeast is killed; gelatinisation occurs as water is absorbed by the starch granules which swell; gluten coagulates at 70 °C due to enzymes being denatured by heat; water and alcohol escape from the dough due to evaporation; CO_2 escapes from the dough due to gases expanding and rising; dextrin forms on the outside of the loaf due to starch reacting with dry heat;	**5**
8(f)(i)	these foods are <u>fermented</u>; by the addition of bacteria; causing lactic acid to be produced; preventing pathogens from surviving in the food's acidic environment;	**3**
8(f)(ii)	yoghurt; cheese; sourdough; crème fraiche; salami; ayran; kimchi; kombucha; Quorn; AVP;	**1**

Question	Answer	Marks
8(g)	enzymes in the fruit; convert hard, starch packed cells; to sugar; that dissolves;	**3**