CAMBRIDGE
International Education

Cambridge International A Level

FOOD STUDIES **9336/01**

Paper 1 Theory **October/November 2024**

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 2024 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 descriptions 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.

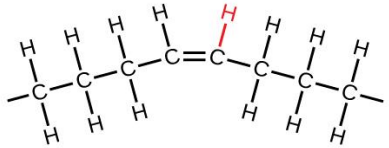
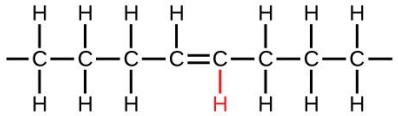
For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

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

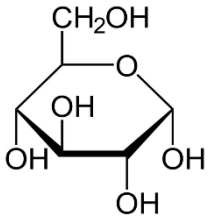
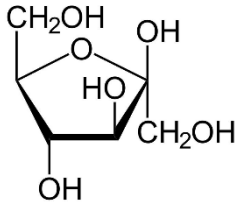
Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

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

Question	Answer	Marks
1(a)	one molecule of hydrogen is absorbed by each double bond; in the presence of a catalyst / nickel; liquid / unsaturated fat turns – to solid / saturated fat;	**2**
1(b)(i)	 ***cis*-fat molecule**  ***trans*-fat molecule** *Cis* hydrogen is attached on the same side of the double bond; is a high energy configuration; no rotation around double bond; *Trans* hydrogen attached to carbon double bond on opposite sides of double bond; low energy configuration; no rotation around double bond;	**4**
1(b)(ii)	Stops emulsion separating after mixing; increases thickness; enhances flavour release; gives uniform texture; maintains spreadability; enables fat reduction;	**2**
1(c)	Alpha-linolenic acid; walnut / linseed / chia / kiwi / shiso / soybean / kale; Linoleic acid; flaxseed / salmon / fish oils / eggs / meat / sunflower oil; Arachidonic acid; chicken / eggs / liver;	**2**
1(d)	Charred / old food particles contaminate oil – altering flavour / colour of oil; Oil degrades due to high frying temperature – altering flavour / colour of oil; Hydrolysis occurs / free fatty acids are formed – tainting the taste of the food; Reheating oil increases number of free fatty acids – tainting the taste of the food; Reheating the oil lowers the smoke point / fat will burn at a lower temperature – tainting the taste of the food; Heating beyond the smoke point produces acrolein – creating harmful carcinogens / altering cell DNA; oxidative rancidity can occur / the double bonds of an unsaturated fatty acid can be cleaved by free-radical reactions involving molecular oxygen – produce objectionable flavour and aroma;	**4**

Question	Answer	Marks
1(e)	(Hypervitaminosis A) is when the body has an excess of / poisoned by vitamin A; acute is when large amounts are ingested over a short space of time e.g. taking supplements; chronic when large amounts build up over a long period of time; as a fat-soluble vitamin it is stored in the body / liver; *Symptoms:* blurred vision / double vision; yellow discolouration of skin; bulging fontanelle / softening skull bones in infants; hypercalcaemia; hair loss; peeling / itchy skin; vomiting; liver damage; cracks at corner of mouth; high sensitivity to sun; heart valve calcification;	**4**
1(f)	Concentrated energy – 9 kcals per 1 g / 37.7 kJ per 1 g; Stored as adipose tissue – warmth; Phospholipids help the formation of cell membranes – acting as a barrier to the passage of molecules and ions in / out of the cell; Nerve impulse transmissions – fat serves as a good insulator and the myelin sheaths speed the rate of transmission of an electrical impulse along the axon; Omega fatty acids cannot be made by the body so must be taken in food – Omega 3 lowers risk of cancer / lowers inflammation e.g. rheumatoid arthritis / lowers risk of depression / may help Alzheimer patients / helps grey matter and brain membranes / Omega 6 lowers LDL / raises HDL; Production and regulation of steroid hormones – oestrogen in ovaries / androgen in testes / progestin in adrenal cortex; Protection of internal organs – kidney / heart / liver is cushioned from shock and injury; Fat soluble vitamins are only found in foods containing fat –fat acts as a transporter of fat-soluble vitamins ADEK; High satiety value – digestion takes longer / feel fuller for longer / less snacking in-between meals;	**6**
1(g)	3.75 kcals per 1 g / 16 kJ per 1 g;	**1**

Question	Answer	Marks
2(a)(i)	Glucose AND fructose	**1**

Question	Answer	Marks
2(a)(ii)	  Glucose Fructose	**1**
2(a)(iii)	Monosaccharides linked together by O-glycosidic bond; most commonly at 1–4 link where carbon is bonded to oxygen on C4 of second sugar; usually 3–10 monosaccharide / short chains units but can include disaccharides); more than 10 is classed as polysaccharide; may be linked to other biomolecules / nutrients e.g. peptides / lipids; hydrolysis can split the oligosaccharide into units of monosaccharides;	**3**
2(a)(iv)	Raffinose; legumes / cabbage / wholegrain / beans / sprouts / broccoli / asparagus; Stachyose; green beans / legumes / soybeans; Verbascose; lentils / peas; Fructo-oligosaccharide; chicory / onion / asparagus / wheat / tomato/ cane sugar / seaweed;	**2**
2(b)(i)	Sugar crystals dissolve in liquid when heated; liquids will reduce in volume through evaporation; sugar concentration increases; water molecules struggle to keep the sugar separate from each other; the sugar molecules bonds to each other; forming crystal seeds; dissolved sugar molecules can join the seeds; encouraged by stirring / agitation / stirring / beating; supersaturated syrup incorporates air and promotes the formation of sugar crystals; due to the rapid movement of the molecule;	**3**

Question	Answer	Marks
2(b)(ii)	remove any sugar crystals on the side of the pan to prevent seeds forming; use an acid / lemon juice will invert sucrose; use an invert sugar like corn syrup / honey so fewer sugar molecules available to cluster together / glucose and fructose can physically block the remaining sugar molecules from one another; do not stir as it encouraged crystals to bond; ensure high temperature is reached; use clean pan so seeding is reduced; remove any impurities from sugar before heating; heat gently until all sugar is dissolved; add a small amount of water; partially put lid on pan;	**3**
2(c)(i)	phytates; tannins; oxalic acid; phytic acid; calcium;	**1**
2(c)(ii)	vegan diet is non-haem / Fe3+; therefore iron is less available to be absorbed; non-haem iron more readily bound by inhibitors; found in plants / fruit / seeds; Haem iron / Fe2+ is organically bound / found in meat / fish; haem iron is absorbed more readily than non-haem iron; haem iron can increase absorption of non-haem iron but vegan will not eat these food sources;	**3**
2(d)(i)	the minimum number of calories / energy required to keep your body functioning at rest;	**1**

Question	Answer	Marks
2(d)(ii)	Body size – metabolic rate increases as weight / height / surface area increase; Body composition – fat tissue has a lower metabolic activity than muscle tissue / as lean muscle mass increases, metabolic rate increases; Gender BMR averages 5 to 10% lower in women than in men – this is largely because women generally possess more body fat and less muscle mass than men of similar size; Age: a decrease in lean muscle mass during adulthood results in a slow, steady decline per year in BMR after the age of about 30; children go through periods of growth with extreme rates of metabolism; Climate and body temperature BMR of people in tropical climates is generally 5 to 20% higher than their counterparts living in more temperate areas – because it takes energy to keep the body cool / exercise performed in hot weather also imposes an additional metabolic load/ body fat content and effectiveness of clothing determine the magnitude of increase in energy metabolism in cold environments as it takes energy to keep the body warm if you work or exercise in very cold weather; Hormonal levels Thyroxine (T4), the key hormone released by the thyroid glands has a significant effect upon metabolic rate – hypothyroidism is relatively common, especially in women near or after menopause / the thyroid gland does not make enough of the thyroxine, and metabolism slows down / slower metabolism can causes weight gain / fatigue; Health sports injury and minor surgery may increase BMR by 15–20% – fever / rise in body temperature increases the rate of cellular metabolic reactions; High activity level – increased BMR due to increased need for calorie intake; Drugs – caffeine and nicotine can increase BMR / medications such as antidepressants and steroids increase weight gain regardless of what you eat;	**4**
2(e)(i)	Marasmus is a severe form of PEM that results when a person does not consume enough protein and calories; Kwashiorkor's main deficiency is protein;	**1**
2(e)(ii)	*Marasmus:* acute loss of body fat and muscle tissues / leading to an unusually low body mass index (BMI); type of wasting and failure to grow, known as stunted growth; bones become visible under their skin; sunken eyes / wizened face / old person's face; *Kwashiorkor:* oedema; changes in hair colour to yellow or orange / dry hair patches of skin turning unusually light or dark; skin shedding; liver enlarged and fatty; anaemia;	**2**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>3(a)</td><td>
<table>
<tr><td>Where</td><td>Enzyme</td><td>Action</td></tr>
<tr><td>Stomach</td><td>Proteolytic enzyme / Rennin

Pepsin</td><td>Clots casein / protein

Breaks proteins down to peptones by breaking / hydrolysing peptide bonds; several polypeptide chains formed; in presence of acid / gastric juice;</td></tr>
<tr><td>Pancreas</td><td>Trypsin / precursor of trypsinogen

Pancreatic lipase</td><td>Breaks down protein to peptones;

Breaks down triglycerides to fatty acids and glycerol; partial breakdown;</td></tr>
<tr><td>Gall bladder

Liver</td><td>Bile stored here

Forms bile</td><td>Fats are emulsified; bigger surface area to aid digestion; alkaline for digestion in small intestine;</td></tr>
<tr><td>Duodenum</td><td>Lactase

Lipase continues

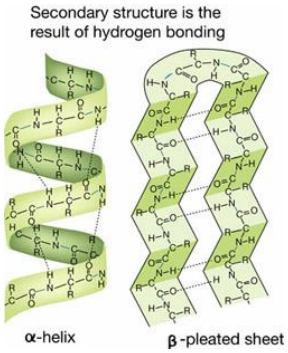
Erepsin / peptidase</td><td>Breaks lactose a disaccharide – into galactose and glucose, monosaccharides;

Breaks fats down into fatty acids and glycerol;

Converts peptones into amino acids;</td></tr>
</table>
</td><td>9</td></tr>
<tr><td>3(b)</td><td>People with lactose intolerance do not produce enough lactase; to break down lactose into glucose and galactose; which can be easily absorbed into the bloodstream; undigested lactose moves to the colon; where it is fermented by bacteria; lactose is not digested / broken down so cannot be absorbed;</td><td>3</td></tr>
<tr><td>3(c)</td><td>Milk and dairy products contain calcium; protein and vitamin D, vitamin A and vitamin B_{12};
these nutrients are important for the maintenance of strong / healthy bones;
lack of these nutrients may lead to not building peak bone mass;
with lactose intolerance, digestion and absorption of these nutrients is reduced / people avoid eating dairy produce;</td><td>2</td></tr>
</table>

Question	Answer	Marks
3(d)(i)	Potassium: raisins / dates / sunflower seeds / banana / orange / chard / fig; Sodium: cured meat / canned meat / vegetables in brine / anchovies; Fluoride: tea / chicken / oatmeal / almonds / sardines / miso / beef / raisins; Chloride: seaweed / tomato / lettuce / olives / prawns / tuna / salmon;	**4**
3(d)(ii)	Potassium: hyperkalemia / sudden, uncontrollable muscle contractions/ mood changes/ breathing difficulties / heart palpitations / kidney damage; Sodium: hypernatraemia / confusion / muscle twitching/ seizures/ coma / death / high blood pressure / headache/ vomiting / frequent urination / thirst / oedema; Fluoride: skeletal or dental fluorosis / respiratory paralysis / cardiac failure / white flecks on tooth enamel / enamel has pitted brown decay look / increased bone density and stiffened joint/ knocked knee syndrome / gastrointestinal problems / spondylosis; Chloride: hyperchloremia / renal tubular acidosis / dehydration / kidney disease / sweating / dry mucous membranes;	**4**
3(e)	cutting damages cells; damaged cells release polyphenol oxidase and phenol; oxidation (in presence of oxygen) produces new chemicals, o-quinones; which react with amino acids; to produce brown-coloured melanins; process is known as enzymic browning;	**3**

Question	Answer	Marks
4(a)	a harmful / dangerous reduction in the amount of water in the body;	**1**
4(b)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$ + energy	**2**
4(c)	Water is created inside a living organism through their metabolism / respiration; by oxidising energy containing substances in their food; end / by product of the oxidation of energy-containing molecules; water chemically bound to glycogen is released when glycogen is oxidized;	**2**

Question	Answer	Marks
4(d)	Alpha helix; Hydrogen bond is formed between the carbonyl group of one peptide bond and the amine group of another; within the polypeptide / can be single chain; R group / side chain faces outwards; Beta pleated sheet; Hydrogen bonds are formed between neighbouring peptide chains; linking 2 or more beta strands; R group / side chain face both inwards and outwards;  	**6**
4(e)	Marinade / tenderising powder / yoghurt rub / bromelin rub / ficin rub / papain rub; where the acid or enzyme causes the collagen tissue to weaken on the surface; Add enzymes / bromelin / papain / ficin; to speed up / catalyse the breakdown of proteins into amino acids; Hanging meat for a few days; to increase acidity / decreases pH; Pounding / cutting / grinding; cuts of meat have long muscle fibres that run throughout them so by cutting crosswise against the muscle fibres they come apart easily and effortlessly / break connective tissue; Add acids / vinegar / wine / lemon juice / yoghurt; to tenderise meat by denaturing or unwinding the long protein in the muscle; Add alkali / baking soda; to make it harder for the proteins to bond and keep the meat more tender when cooked; Brining / adding salt; to draw out the liquid from the meat by osmosis then the brine is reabsorbed into the meat while breaking down muscle structures; Slow cooking / moist cooking; collagen breaks down in the cooking liquid and breaks down tough muscle fibres into separate strands; Allow rest time; allows juices to distribute evenly so no dry, tough spots as the moisture is re-absorbed;	**8**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>4(f)(i)</td><td>Deamination is the removal of an amino group (-NH_2) from a compound / amino acid; usually by hydrolysis; to make ammonia (NH_3);</td><td>2</td></tr>
<tr><td>4(f)(ii)</td><td>
<table>
<tr><th>Deamination</th><th>Transamination</th></tr>
<tr><td>Irreversible process.</td><td>Reversible process.</td></tr>
<tr><td>Removal of amino from amino acid.</td><td>Transfer of amino group from one molecule to another, especially amino acid or keto acid.</td></tr>
<tr><td>Breakdown of excess protein.</td><td>Synthesis of non-essential amino acids.</td></tr>
<tr><td>Occurs in the liver</td><td>Occurs in all body cells.</td></tr>
<tr><td>Results in the elimination of ammonia.</td><td>Results in exchange of amino group with a keto group.</td></tr>
<tr><td>Glutamic acid is the primary form of amino acid which undergoes deamination.</td><td>Glutamic acid is the main form of amino acid produced in transamination reactions.</td></tr>
</table>
</td><td>3</td></tr>
<tr><td>4(g)</td><td>less than 11% of food energy or less than 20 g (per 2000 calories)</td><td>1</td></tr>
</table>

Question	Answer	Marks
5(a)	1–2 cloves of garlic salt / pepper 5–10 g basil / oregano / thyme 1 tablespoon olive oil 350 g / 5–6 medium fresh tomatoes pinch sugar Method Place tomatoes in a bowl, pour boiling water on them and leave for around 30 seconds then immediately transfer them to a bowl of cold water – when cool enough to handle the skins will slip off easily; to de-seed remove the stalk, slice each one in half, not through the stalk end but around the middle, remove seeds with a teaspoon; chop roughly; Peel and finely slice the garlic heat oil in a pan and fry garlic until coloured lightly, add tomatoes and use the back of a wooden spoon, squash the tomatoes; Season the sauce and as it comes to the boil, remove the pan from the heat; Strain the sauce through a coarse sieve into a bowl or blend / puree in a food processor / stick blender; Discard the (fresh) basil and garlic that will be left in the sieve; Pour the sauce back into the pan, bring to the boil, then turn the heat down and simmer for 5 minutes to reduce sauce;	**4**
5(b)	Cool, clean and dry place – to prevent rusting and leaking as dampness may corrode metal lids; Dispose of leaking cans – as it means there is a place that has been exposed to air, allowing contamination of the contents; Dispose of dented / swollen / gassy cans – may contain pathogens; Rotate stock – ensures that food is used within best before date; Check expiry date – use high-acid foods like fruit, pickles and tomatoes within 2 years of the date on the package, to maintain quality; Not in fridge after opening – highly acidic foods like tomatoes can absorb the coating of the can, resulting in an off taste / tin and iron will dissolve from the can walls and the food may develop a metallic taste; Out of sunlight – food will lose quality through heat from the sun in a few weeks or months / may discolour / loss of nutrients;	**3**

Question	Answer	Marks
5(c)	**Comparisons** Both freeze drying and dehydration removes moisture from food; freeze-drying removes 98% of the water in foods while dehydration removes about 90%; **Contrasts** Freeze-dried products have a much longer shelf-life as more moisture is removed than dehydration; Original flavour and shape are maintained in AFD/ dehydrating, but there are noticeable changes to the texture and appearance of foods; Freeze-dried foods rehydrate more quickly, usually in 5 minutes or less (dried berries, almost instantly), in hot or cold water; Dehydrated foods take 10–20 minutes to rehydrate, usually need boiling water; Freeze-dried foods retain most nutrients found in the original food but lack Vitamin C; Dehydration tends to result in the loss of Vitamins A and C, thiamine, riboflavin and niacin; AFD is more expensive to carry out due to more time and expensive equipment needed / also used for commodities in demand or seasonal; Dehydration is a cheaper method and can be done domestically in the sun;	**5**
5(d)	Advantages: Manufacturers use genetic modification to give foods desirable traits, for example, they have designed two new varieties of apple that turn less brown when cut or bruised; crops more resistant to diseases as they grow; engineer produce to be more nutritious or tolerant of herbicides; plants that are more resistant to diseases spread by insects or viruses result in higher yields / profits for farmers; can also increase nutritional value or enhance flavour; ensure that more people have access to quality food; Disadvantages: little is known about the long-term effects and safety; GM foods may have more potential to trigger allergic reactions because they may contain genes from an allergen; eating GM foods may contribute to the development of cancer because the disease is caused by mutations in DNA, it is dangerous to introduce new genes into the body; may cause antibiotic resistance as some crops are modified to include antibiotics it reduces the effectiveness of an antibiotic or other medication when it is needed in the traditional sense; cross-pollination is possible between GM crops and non-GM crops and GM crops may be patented leading to farmers subjected to legal liability; genetic migrations are known to occur and unforeseen complications to future crop growth where the benefits of GM foods may not outweigh the problems that they cause;	**4**

Question	Answer	Marks
5(e)	Structure – protein coagulates during baking and sets to form a framework; Emulsifier – emulsifiers found in eggs include lecithin in the yolk and albumin in the whites – egg proteins used as emulsifiers have a hydrophilic and hydrophobic ends -they create bridges between the oil molecules and water by the hydrophobic end bonding to the oil while the hydrophilic end adheres to the water molecules – these bridges allow for better stability of the finished mixture; Shortening – fat from yolks shorten the gluten strands in the flour, yielding a softer, less chewy crumb; Flavour – the yolks provides a rich flavour; Maillard reaction – a chemical reaction between amino acids in the egg and reducing sugars – melanoidins are formed that give a brown colour on the surface – cake has distinctive aromatic qualities; Raising agent – moisture in the egg turns to steam, expands and rises – egg white, especially, traps air when whisked, on baking the air expands and rises giving a light, airy structure; Colour – carotenoid / xanthophyll are yellow pigments found in yolks – they are a bright, stable colour and add colouring to the cake; Preservation – fat in the yolk acts a preservative and slows down staling; Mouthfeel – the fat from the yolk gives the cake a richer, moister texture;	**5**
5(f)	Food intolerance and allergies / lactose / coeliac / peanut / shellfish / eggs + explanation; Religious beliefs Hindu / Sikh / Buddhist / Muslim / Rastafarian / Jain / Jew + explanation; Income / budget / only buy what is needed / use what you have in stock / sensible use of convenience foods + explanation; Cooking facilities / microwave / access to hob and oven / fridge / freezer / processor + explanation; Time available / sensible use of convenience foods / preparing ahead / use of freezer / microwave / slow cooker / auto oven + explanation; Cooking skills + explanation; Season / buying / availability in shops / climate / weather conditions+ explanation; Lifestyle choices + explanation; Personal preferences including vegetarian + explanation; Age + explanation; Amount of people cooking for – avoid food wastage or inadequate amounts; Attractiveness of meal / colour / presentation + explanation;	**4**

Question	Answer	Marks
6(a)	Preparation: produced commercially so – buy from reputable source / follow specification chart / carry out quality checks; Cooking: in bulk so must reach core temperature of 75 °C; check temperature with probe; Portioning / sealing / labelling: should include date of production, expiry and description; portioned in trays usually 5cm deep to enable quick chilling; difficult to do after chilling; Chilling: in a blast chiller or ice bath for rapid temperature reduction; from 75 °C to 3 °C in 90 mins; bacteria grown rapidly 5–63 °C so speed is important; speed of cooling is influenced by size / shape / weight / density of food; Storing: must be 0–+3 °C to reduce the rate of bacteria multiplying; keep for max 5 days as bacteria will have multiplied / food becomes dangerous to consume; must be refrigerated until ready to use to reduce bacteria multiplying; use FIFO / stock rotation for safety / quality / prevent waste; Regeneration: can be by steam but usually convection; must reach 75°C to kill bacteria to a safe level; Serving: cook-chill to be consumed cold must be eaten within 30 mins from taken out of fridge; hot consumption of cook-chill must be eaten within 15 mins of regeneration; any regenerated food not consumed must be destroyed as it has been cooked and reheated / bacteria will have multiplied to an unsafe level;	**6**
6(b)	Altering the composition of the internal atmosphere of a package to improve the shelf life. Reduction of O_2 promotes delay in deteriorative reactions in foods such as lipid oxidation/browning reactions / growth of microorganisms / slow down respiration rate in fruits / vegetables; Red meat with high levels of O_2 are used to reduce oxidation of myoglobin and maintain an attractive bright red colour; N_2 is used to prevent oxidative rancidity in packaged snack foods by displacing oxygen, therefore extending shelf life; The use of noble gases such as Helium (He), Argon (Ar) and Xenon (Xe) to replace N_2 can also be used to preserve and extend the shelf life of fresh and minimally processed fruits and vegetables; CO_2 increase blocks ethylene action so fruits slower to ripen;	**3**
6(c)	*Clostridium perfringens* is a type of anaerobic; bacterium; gram positive; spore forming; found in soil / animal intestines / raw meat; no flagella; rod shaped; causes food poisoning by enterotoxins being released in the gut; can reproduce every 10 minutes; though not below 10°C or above 63°C; spores can survive boiling / slow roasting;	**6**

Question	Answer	Marks
6(d)(i)	Electromagnetic radiation passes through water molecules; water in food has dielectric properties / polar molecules; polar molecules continuously rotate to align with the electromagnetic field; friction is caused; electromagnetic energy is changed to heat energy; temperature in the food increases; heat is transferred via conduction;	**4**
6(d)(ii)	Carry over / residual cooking time – allows for a uniform spread of temperature / no cold spots; 75 °C reached – so (most) bacteria are destroyed;	**2**
6(e)	Fridge-freezers –less floor space / choose ratio fridge-freezer; Size / capacity – family needs / shopping in bulk / preservation / space available; Chest / upright – bulky non uniform items easier to use a chest / defrost a chest less often / easier to organise in upright; Alarm – warns so preventing unwanted defrosting / food wasted / lower insurance premiums; Fast freeze – extra low temp for home freezing minus 23 °C / better quality as smaller ice crystals formed / good if freezing from fresh; Frost free – automatically defrost freezer so saves time and effort; House / garage – space available in kitchen or garage/ manufacturer guarantees freezer carries on working if ambient temperatures drop as low as minus 15 °C; Price – your budget / comparison sites for best price; Freestanding / integrated – match kitchen style; Make -match other appliances / good reputation; Energy efficiency – lower carbon footprint / less fuel so cheaper bills;	**4**

Question	Answer	Marks
7(a)	crack / dehull the raw soya beans and soak overnight in acidified water (pH3–5); partly cook then cool and dry the beans; inoculate the beans with mould / fungus / Rhizopus oligosporus / Rhizopus oryzae and spread the beans thinly; seal with perforated plastic and incubate at 30 °C for 48 hours to allow fermentation to take place;	**3**

Question	Answer	Marks
7(b)(i)	White flour has no bran – more aesthetically pleasing / no brown flecks; strong plain flour contains two insoluble proteins / gliadin and glutenin – which when mixed with a liquid form needed gluten; higher gluten content than soft plain flour/12–14% protein – allows for stretching; puff pastry is a laminated pastry – higher gluten content enables lots of layers to be produced; gluten supports the structure – by stopping the air from escaping / holds pockets of air in the mixture;	**4**
7(b)(ii)	Water turns to steam causing the layers of pastry to separate and expand; Starch (partly) gelatinises before the fat is absorbed; Fat melts and is absorbed into gelatinised flour; Gluten framework sets / coagulates into crispy flaky layers; Maillard reaction gives golden brown finish from egg / milk; Starch forms dextrins / dextrinisation / browning on the surface of the pastry;	**5**
7(b)(iii)	Cheaper to buy product than individual ingredients; skill / experience lacking; can be ready rolled so better results; saves time as process is time consuming; convenient to store / have in freezer for when you want to use it;	**2**

Question	Answer	Marks
7(c)	to destroy natural toxins in food e.g. red kidney beans / cassava and prevent poisoning the consumer; to kill pathogenic microbes / salmonella e.g. in raw chicken and prevent food poisoning; to provide hot food in cold weather e.g. soup, to warm the consumer; to reduce bulk of food e.g. green vegetables / cabbage, to make it easy to eat enough; to make food softer e.g. meat is tenderised, so consumer can chew it; to make food more digestible e.g. cooked starch / potato / rice / pasta would not be digestible when raw / would cause stomach ache; to make food more attractive / appetising by changing the colour of food e.g. caramelisation / dextrinisation / Maillard browning in pastry / cakes / meat, will cause browning; to develop / change texture e.g. egg sets on heating, bacon crisps up and is more enjoyable to eat; to improve / change flavour e.g. extractives in meat are developed during cooking, and these taste good; to improve the smell of food, e.g. curry, fried bacon, as this stimulates the flow of digestive juices; to add variety to the diet e.g. eggs can be poached, fried, boiled , scrambled, and this retains a consumer's interest; to preserve food and prevents spoilage / decay e.g. jam / pickles / tinned fish, and this prevents food waste; to achieve the technique / cooking process, e.g. thickening a sauce / rising a cake, or the recipe wouldn't work / outcome wouldn't be achieved; to create new dishes from a range of ingredients e.g. quiche, chocolate cake, so that we have a wide range of foods / choices;	**6**
7(d)(i)	The effective arrangement of the fridge / freezer, sink and cooker where most of the preparation, cooking, and cleaning takes place.	**1**
7(d)(ii)	Bright lights / well positioned lights, to prevent accidents; No curtains above a cooker, to avoid spread of fire; Cooker not directly behind a door, to avoid knocking off hot pans with the door; Non slip flooring, to prevent falls; Fire guard / cooker with child lock, to keep children out of danger; Good ventilation, to prevent build up of fumes / gas; Reachable cupboards / worktops at correct height, to prevent strain / falls; Correctly placed carbon monoxide tester, to ensure detection of poisonous gas; No steps / steps with fluorescent edge, to prevent falls or to alert person to presence; Halogen hob not ceramic hob, as it cools immediately and prevents burns;	**4**

Question	Answer	Marks
8(a)	Pome: fleshy fruit consisting of an outer thickened fleshy layer and a central core with usually five seeds enclosed in a capsule; Drupe: fleshy fruit with thin skin and a central stone containing the seed; Berries: a small roundish juicy fruit without a stone;	**3**
8(b)(i)	pectin binds to cholesterol in the gastrointestinal tract; slows glucose absorption; and reduces blood cholesterol;	**1**
8(b)(ii)	acts as gelling agent by forming a network that holds onto water;	**1**
8(b)(iii)	creates a set yoghurt / acts as a stabiliser / enhances sensory qualities e.g. texture, mouthfeel, appearance, viscosity / consistency, prevention of whey separation / provides a more uniform consistency; by preventing the separation of fats and water;	**2**
8(c)	Heat milk to 80–85 °C then cool milk to 40–45 °C; add culture / starter and stir; incubate at 38 °C for 6–8 hours; cool to 4 °C / fridge to stop fermentation;	**4**

Question	Answer	Marks
8(d)	*Ethical* Animals do not live a natural life / kept for commercial use – are treated cruelly – beak ends removed / tails docked – for convenience of farm conditions; Kept in cages – little movement permitted – sows kept in gestation then farrowing cages – piglets removed almost immediately – high stress and anxiety to sow – artificially impregnated shortly after having litter – sow is used as a breeding machine rather than as a living being; Animals are kept in overcrowded conditions – diseases easily spread – (over) use of antibiotics to prevent disease; Aim of factory farming is maximum profit in little time – animals are fed high calorie food for quick weight gain – legs may not hold weight; Crops fed to industrially reared animals could be used to feed extra / starving humans on the planet; *Sustainability* Cattle produce masses of manure – high in methane gas – global warming / greenhouse gas – factory farms are concentrated sources of methane; Mass of manure is a problem for disposal – can be collected into lagoons / pits – can overflow into waterways and infect them – high Nitrogen reduces Oxygen / hypoxic in lakes / streams / rivers – destroying aquatic life – waterways can be polluted by runoff from pesticides, fertilizers, antibiotics directly linked to factory farms; Increase in deforestation – land for factory farm animals to graze or be used for intensive crop production to grow their food – increases CO_2 – destroys habitats – endangers species – biodiversity decreases- extinction; Land used for factory farm animal feed is a monoculture – corn or soy most common – deplete certain nutrients – less microorganism can survive – soil becomes barren / soil is eroded; Overuse of groundwater – especially in drought areas – irrigation of crops and animals – cleaning tasks – drinking water for humans – difficult to replace for future generations;	**8**
8(e)	*Beta glucans* slows food transit resulting in feeling fuller for longer; Carbohydrate absorption is slower leading to a steadier blood sugar level; The gel formed by *beta glucans* in the stomach and small intestines lowers cholesterol levels in the blood;	**2**
8(f)	Preheat oven shortly before use; use all zones of the oven / cook on all shelves / batch cooking; choose smaller joints as they cook in less time; turn off heat just before the end of cooking time and use residual heat to complete; use / choose a fan oven or convection oven as air is circulates heats and temperature set can be reduced; baked potatoes can be skewered – the metal conducting heat so cooking time and fuel reduced; keep the oven door closed to stop heat escaping;	**4**