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Mark Scheme (Standardisation)
Summer 2008 Final

GCE

GCE D&T (6154/01)

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Product Design: Food Technology (6154/01)		
Question Number	Answer	Mark
1(a)(i)	Raw materials can be sorted into the following categories: • Size (1) • Shape (1) • Colour / color (1) • Weight (1) *Only acceptable answers*	**(2x1)**
(ii)	Reasons for sorting: • makes mechanical processing easier e.g. slicing, dicing (1) • makes packaging easier e.g. 4 pack of fruit (1) • makes heat penetration easier e.g. canning (1) • makes heat reduction easier e.g. freezing (1) • makes product more attractive to consumer (1) • to ensure consistent quality (1) • materials are within a tolerance (1) *Only acceptable answers*	**(3x1)**
(b)	Grading: • Assess the quality (e.g. check for bruising / check for colour / check for damage / free from contamination) (1) • Assess against a set of criteria (1) • Separate into different groups based on outcome of assessment. (1)	**(3x1)**

Question Number	Answer	Mark
2(a)(i)	Examples of size reduction: • Slicing / shredding (1) • Dicing (1) • Chopping (1) • Grating (1) • Grinding (1) • Pulping / crushing / mashing (1) • Milling (1)	**(2x1)**
(a)(ii)	Materials which are difficult: • Fibrous (1) • Elastic (1) • Viscous (1) or named example: • **Meat** e.g. beef / lamb / chicken / pork / any named meat / poultry / game (1) • **Fish** e.g. cod / salmon / tuna / any named fish / shellfish (1) • **Dough** (1) • **Liquids** (1) e.g. eggs	**(2x1)**
(b)	Considerations when using machinery: • mixers must be powerful and strong enough to do job (1) – machinery will brake down (1) • heavy, strong elements are required (1) – produce an even through mix (1) • mixing elements capable of reaching dead spots in the mixing vessel (1) – enables consistent quality (1) • Z blade mixers required – (1)to reach dead spots (1) • Z blade mixing elements - (1) ensure thorough mixing /even mixing of ingredients (1) • Difficultly in mixing materials - (1) due to high viscosity (1)	**(2x2)**

Question Number	Answer	Mark
3(a)	Main consumer rights: • to safety (1)- e.g. allergies / no risk of food poisoning / packaging will not injure the consumer (1) • to information (1) - e.g. balanced diet / accurate nutritional / labelling and marketing (advertising) information (1) • to consumer education (1) e.g. access to knowledge about the products (1) • to a safe environment (1) e.g. free from pollution and hazardous waste, recyclable packaging (1) • to redress (1) e.g. compensation for unsafe or misleading products (1) *Only acceptable answers*	**(2x2)**
(b)	Reasons why purchasing and consumption are becoming increasingly fragmented: • more varied food and drink products being consumed on more occasions (1) • increase in eating on the move (1) • increase in purchasing from various food outlets (1) • increase in dash-board dining (1) • increase in snacking, TV dinners and pre-prepared-microwave ready-meals (1) • increase in convenience products (1) • increase in grazing – nibbling throughout the day (1) • increase in student, single households (1) • increase in novelty, health and luxury purchasing (1) • constant innovation and product differentiation (1) • more casual / busier lifestyle (1) • instant gratification (1)	**(4x1)**

Question Number	Answer	Mark
4(a)(i)	Emulsifier (in pastry): • dough conditioner • improves structure and texture • facilitates aeration *Only acceptable answers*	**(2x1)**
(a)(ii)	• thickener • prevents retrogradation / syneresis / separation *Only acceptable answers*	**(2x1)**
(a)(iii)	• aids gel formation of both custard and glaze • prevents water loss from custard and fruit • tolerates acidic conditions therefore suitable for glazing fruit • excellent film producing qualities • stabilises – prevents separation • holds water / binds / traps *Only acceptable answers*	**(2x1)**
(b)	• enhances water binding properties • increases rate of gelling • reduces discolouration of cut fruit • produces tart taste / effects flavour • ensures pH is constant, due to use of fruit *Only acceptable answers*	**(4x1)**

Question Number	Answer	Mark
5(a)	Functional properties of additives: • physical characteristics e.g. modifying texture (1) • sensory characteristics e.g. colour, flavour, mouthfeel (1) • storage life e.g. preservatives (1) • nutritional status e.g. iron in breakfast cereals (1) • aid to processing e.g. anti-caking agent to produce free-flowing powders (1) *Accept named functional property and/or example. Only answers*	**(2x1)**
(b)(i)	Use of xanthan gum in sauces: • thixotropic properties (1) • thins when agitated and thickens on standing (1) • produces excellent mouthful (1) • allows rapid flavour release / taste (1) • allows for easy removal from container (1) • thickens / prevents separation (1) • aids production (1) • absorbs water (1) *Only acceptable answers*	**(4x1)**

Question Number	Answer	Mark
(b)(ii)	*Physical characteristics:* **Name:** Cellulose / starch / modified starches / pectin / hydrocolloids / gums / alginates / gelatine (1) **Effect:** products made thicker and / or gelled (1) substances capable of holding large quantities of water within structure (1) **Name:** Citric / phosphoric / malic / lactic acid (1) **Effect:** products made more or less acid (1) buffers control acidity (pH) in product (1) **Name:** Raising agents: sodium / potassium / ammonium hydrogen carbonate Or mechanical methods: whisking / pumping (1) **Effect:** aerated with gas bubbles by production of C02 / air pumped into product (1) **Name:** Emulsifiers: mono and di-glycerides / lecithin (egg yolk / soya); Stabilisers: carbohydrates (starches) / hydrocolloids (gums / alginates) (1) **Effect:** prevents separation of oil and liquid (1)	**(2x1)** **(2x1)** **(2x1)** **(2x1)**

Question Number	Answer	Mark
5(b)(ii)	*Sensory characteristics:* **Name:** Flavouring - natural / synthetic: use of herbs / spices, essential oils / enhancers / sweeteners (1) **Effect:** replace/enhance flavour lost in processing (1) **Name:** Colouring - natural / synthetic: plant colours: carotenoids / chlorophylls / anthocyanins / cochineal red (conchilla beetle) / food dyes (1) **Effect:** replaces colour lost in processing / enhances appearance / makes product appealing / colour/flavour association (1) mouthfeel: see answer for physical characteristics *Storage life:* **Name:** Preservatives: sorbic / benzoic acid / potassium nitrate / sodium nitrite / sulphur dioxide (1) Antidoxidants: Vitamin C / Vitamin E / BHA / gallates (1) **Effect:** Preservatives: extend storage life of foods (1) reduce wastage through spoilage by micro-organisms / prevents certain bacteria from growing (1) - Antidoxidants: prevents oxidation of fats and rancidity (1) *Nutritional status:* **Name:** Nutrients: Vit. A, D,C,B group, iron, calcium, zinc (1) **Effect:** use can be technological e.g. anti-oxidant / fortification by law (1) *Aid to processing / facilitates the production of a food stuff* **Name:** (i) solvents used to extract substances (1) (ii) filter aids (1) (iii) anti-caking agent (1) **Effect:** (i) extracts fruit flavours from peels (1) (ii) accelerates the filtration of liquid foods in removing suspended particles (1) (iii) keeps powders free-flowing (1)	**(2x1)** **(2x1)** **(2x1)** **(2x1)** **(2x1)**

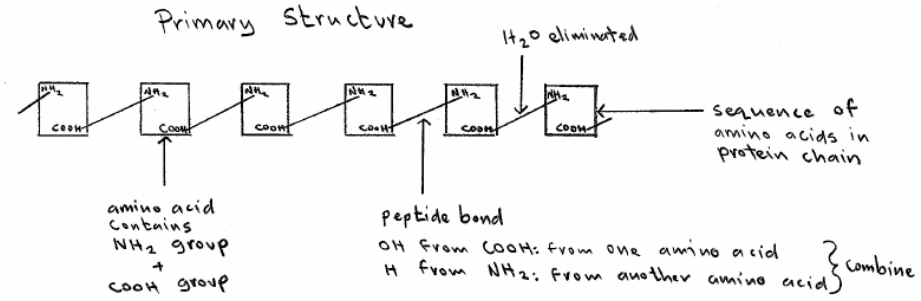
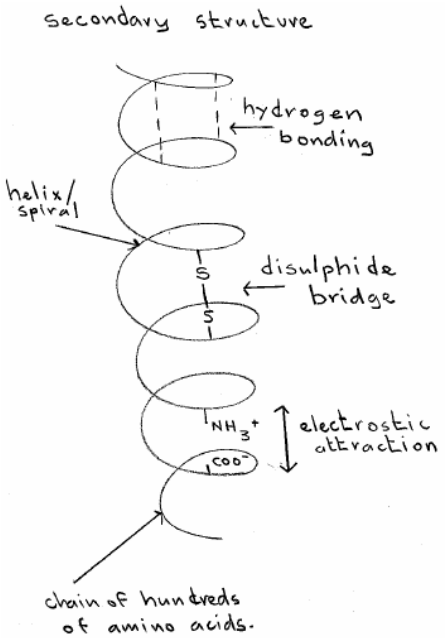
Question Number	Answer	Mark
6(a)	Micro-organisms of particular significance are: • Bacteria (1) • Moulds / Fungi (1) • Yeasts (1) *Only acceptable answers*	**(3x1)**
(b)(i)(ii)(iii)	**Name of bacterium** • *Salmonella* (1) **Food poisoning caused** • cause an infective type of illness (1) **Sources** • found in intestines of man and animals(1) • spread by cross-contamination (1) **Foods** • eggs, egg products, poultry, meat and meat products (1) **Name** • *Clostridium perfringens* (1) **Food poisoning caused** (1) • illness caused by consuming live bacteria which release toxin in intestines (1) **Sources** • found in intestine of man and animals (1) • spores can survive in dirt (1) • flies and bluebottles heavily infected (1) **Foods** • cold and reheated meat and poultry, mince and stews, foods cooked in bulk (1) **Name** • *Staphylococcus aureus* (1) **Food poisoning caused** • toxin released into food, bacteria killed by heat but toxin is heat resistant (1) **Sources** • found in human skin, nose, throat, boils, transferred by hands, cross-contamination (1) **Foods** • cold meats, reheated meats, milk and milk products, un-pasteurised cheese (1)	**(4x1)**

Question Number	Answer	Mark
6(b)(i)(ii)(iii)	**Name** • *Bacillus cereus* (1) **Food poisoning caused** • produces heat resistant exotoxin which is released into food (1) **Sources** • found in soil, dust, water, cereal foods (1) e.g. rice, cornflour **Foods** • rice dishes, cornflour sauces, milk puddings, spices (1) **Name** • *Clostridium botulinum* (1) **Food poisoning caused** • produces exotoxin while growing in food (1) • lethal toxin (1), death rate 50%, outbreaks rare (1) **Source** • found in soil, marine mud, freshwater lake bed, in some fish and vegetables(1) **Foods** • canned, bottled, vacuum packed products, centre of large sausages and cheeses (1) **Name** • *Escherichia coli (E.coli)* (1) **Food poisoning caused** • presence in food or water is used as an indication of faecal contamination (1) • 0157 pathogenic (1), cause for concern (1) • infection (1) **Sources** • found in intestines of man and animals (1) **Foods** • undercooked beef products, cook-chill foods, cheese(1)	**(4x1)**

Question Number	Answer	Mark
6(b)(i)(ii)(iii)	**Name** • *Listeria monocytogenes* (1) **Food poisoning caused** • bacteria produces a toxin which enters the blood stream (1) • food not only vehicle of infection (1) • usually considered a food-borne illness rather than food poisoning (1) **Sources** • found in soil, water, intestines of animals, raw chicken, untreated milk (1) **Foods** • untreated dairy and meat products, salads, vegetables, seafood (1) **Name** • *Campylobacter jejuni, (C.coli / C lari)* (1) **Food poisoning caused** • infective illness **Sources** • found in intestines of animals, including domestic and farm, poultry, meat, shellfish, milk (1) **Foods** • undercooked poultry, un-pasteurised milk, meat, shellfish, can be spread from person to person or animal to person (1)	**(4x1)**

Question Number	Answer	Mark
6(c)	Any **five** from the following seven basic concepts in HACCP: • analysis of the process – (usually a flow diagram, identify hazards, control and prevention) (1) • recognise CCPs – (particular care has to be concentrated in implementing prevention - (measures) (1) • decide on target levels – (prevention and control measures are identified for each CCP, setting critical levels) (1) • develop a monitoring system – (observations, measurements to ensure preventative measures are implemented correctly) (1) • establish a corrective action – (corrective action plan if problem with preventative measures)(1) • install a verification process – (microbial examination and analysis, vital role in verification) (1) • develop documentation – (HACCP to work efficiently, efficient and accurate documentation) (1)	**(5x1)**

Question Number	Answer	Mark
7(a)	advantages of freeze drying are: • little shrinkage in product (1) • fewer flavour changes (1) • no case hardening (1) • good re-hydration characteristics (1) • produces a high quality product (1) • little nutrient loss (1) *Only acceptable answers*	**(4x1)**
(b)	A description that makes reference to the following points: • product frozen (1) subjected to a strong vacuum (1) • small amount of heat by conduction, radiation heating or microwaves added without melting frozen material (1) • ice sublimes off as water vapour without melting (1) • sublimation process is accelerated (1) *Only acceptable answer*	**(4x1)**
(c)	**spray drying process:** Candidates **must** make reference to the following: • a fine spray of the liquid product is produced by an atomizer (1) • spray enters chamber and is met by a blast of hot air (1) • moisture evaporates (1) • dried particles drop to bottom of drying chamber (1) • spray is dried into a fine powder within seconds (1) Candidates can also make reference to: • bacteria can survive process therefore it is necessary to heat process product before drying (1)	**(4x1)**

Question Number	Answer	Mark
8(a)(i)	**Primary structure of protein:** • arrangement of amino acids in protein chain (1) • NH_2 (amine group) of one amino acid reacts with COOH (carboxyl group) from another amino acid to form a peptide link / bond with elimination of H_2O (1) A diagram is acceptable if explained.  	**(2x1)**
(ii)	**Secondary structure of protein:** • primary structure is further linked to produce definite shape: helix/spiral (1) • further linking –SH group forms disulphide bridges (1) • links formed by hydrogen bonding (1) • electrostatic attraction between positively charged amino groups and negatively charged carboxyl groups (1) A diagram is acceptable if explained.  	**(4x1)**

Question Number	Answer	Mark
8(b)	• classified by the protein's amino acid content / contains all essential (indispensable) amino acids / known as 'complete' protein (1) • classified as a High Biological Value (H.B.V.) protein / Low Biological Value (L.B.V.)protein (1) • capable of promoting growth and repair of tissue cells (1) • the body cannot synthesise and therefore obtained from diet (1) • combining proteins to increase biological valve *Only acceptable answers*	**(3x1)**
(c)	Candidates **must** make reference to: • secondary structure of protein is altered (usually irreversible) primary structure remains unchanged (1) • involves the breaking of the cross-linkages which maintain shape of molecule (1) • changing structure (1) Candidates may also make reference to: • unfolded molecules bond with each other – resulting in coagulation (1)	**(2x1)**
	Factors: • action of heat (1) • presence of acid (1) • addition of salt (1) • addition of rennin (1) • mechanical action (1) • presence of alkalis (1) • ethanol (1)	**(1x1)**
	Marks for question	**12**
	Total marks for paper	**80**