

# Mark Scheme (Results) Summer 2008

GCE

## GCE Design & Technology (6154) Paper 1

Unit 6154/01 - Knowledge and Understanding of Product Design

Question Number	Answer	Mark
1(a)(i)	<p>Raw materials can be sorted into the following categories:</p> <ul style="list-style-type: none"> <li>• Size (1)</li> <li>• Shape (1)</li> <li>• Colour / Color (1)</li> <li>• Weight (1)</li> </ul> <p><i>Only acceptable answers</i></p> <p style="text-align: right;">(2x1)</p>	2
(ii)	<p>Reasons for sorting:</p> <ul style="list-style-type: none"> <li>• makes mechanical processing easier e.g. slicing, dicing (1)</li> <li>• makes packaging easier e.g. 4 pack of fruit (1)</li> <li>• makes heat penetration easier e.g. canning (1)</li> <li>• makes heat reduction easier e.g. freezing (1)</li> <li>• makes product more attractive to consumer (1)</li> <li>• to ensure consistent quality (1)</li> <li>• materials are within a tolerance (1)</li> </ul> <p><i>Only acceptable answers</i></p> <p style="text-align: right;">(3x1)</p>	3
(b)	<p>Grading:</p> <ul style="list-style-type: none"> <li>• Assess the quality (e.g. check for bruising / check for colour / check for damage / free from contamination) (1)</li> <li>• Assess against a set of criteria (1)</li> <li>• Separate into different groups based on outcome of assessment (1)</li> </ul> <p style="text-align: right;">(3x1)</p>	3
<b>Total marks</b>		<b>8</b>

Question Number	Answer	Mark
2(a)(i)	<p>Examples of size reduction:</p> <ul style="list-style-type: none"> <li>• Slicing / shredding (1)</li> <li>• Dicing (1)</li> <li>• Chopping (1)</li> <li>• Grating (1)</li> <li>• Grinding (1)</li> <li>• Pulping / crushing / mashing (1)</li> <li>• Milling (1)</li> </ul> <p style="text-align: right;">(2x1)</p>	2
(a)(ii)	<p>Materials which are difficult:</p> <ul style="list-style-type: none"> <li>• Fibrous (1)</li> <li>• Elastic (1)</li> <li>• Viscous (1)</li> </ul> <p>or named example:</p> <ul style="list-style-type: none"> <li>• Meat e.g. beef / lamb / chicken / pork / any named meat / poultry / game (1)</li> <li>• Fish e.g. cod / salmon / tuna / any named fish / shellfish (1)</li> <li>• Dough (1)</li> <li>• Liquids (1) e.g. eggs</li> </ul> <p style="text-align: right;">(2x1)</p>	2
(b)	<p>Considerations when using machinery:</p> <ul style="list-style-type: none"> <li>• mixers must be powerful and strong enough to do job (1) - machinery will brake down (1)</li> <li>• heavy, strong elements are required (1) - produce an even through mix (1)</li> <li>• mixing elements capable of reaching dead spots in the mixing vessel (1) - enables consistent quality (1)</li> <li>• Z blade mixers required - (1) to reach dead spots (1)</li> <li>• Z blade mixing elements - (1) ensure thorough mixing /even mixing of ingredients (1)</li> <li>• Difficulty in mixing materials - (1) due to high viscosity (1)</li> </ul> <p style="text-align: right;">(2x1) (2x1)</p>	4
<b>Total marks</b>		<b>8</b>

Question Number	Answer	Mark
3(a)	<p>Main consumer rights:</p> <ul style="list-style-type: none"> <li>• to safety (1)- e.g. allergies / no risk of food poisoning / packaging will not injure the consumer (1)</li> <li>• to information (1) - e.g. balanced diet / accurate nutritional / labelling and marketing (advertising) information (1)</li> <li>• to consumer education (1) e.g. access to knowledge about the products (1)</li> <li>• to a safe environment (1) e.g. free from pollution and hazardous waste, recyclable packaging (1)</li> <li>• to redress (1) e.g. compensation for unsafe or misleading products (1)</li> </ul> <p><i>Only acceptable answers</i></p> <p style="text-align: right;">(2x1) (2x1)</p>	4
(b)	<p>Reasons why purchasing and consumption are becoming increasingly fragmented:</p> <ul style="list-style-type: none"> <li>• more varied food and drink products being consumed on more occasions (1)</li> <li>• increase in eating on the move (1)</li> <li>• increase in purchasing from various food outlets (1)</li> <li>• increase in dash-board dining (1)</li> <li>• increase in snacking, TV dinners and pre-prepared-microwave ready-meals (1)</li> <li>• increase in convenience products (1)</li> <li>• increase in grazing - nibbling throughout the day (1)</li> <li>• increase in student, single households (1)</li> <li>• increase in novelty, health and luxury purchasing (1)</li> <li>• constant innovation and product differentiation (1)</li> <li>• more casual / busier lifestyle (1)</li> <li>• instant gratification (1)</li> </ul> <p style="text-align: right;">(4x1)</p>	4
<b>Total marks</b>		<b>8</b>

Question Number	Answer	Mark
4(a)(i)	<p>Emulsifier (in pastry):</p> <ul style="list-style-type: none"> <li>• dough conditioner (1)</li> <li>• improves structure and texture (1)</li> <li>• facilitates aeration (1)</li> </ul> <p><i>Only acceptable answers</i></p> <p style="text-align: right;">(2x1)</p>	2
(a)(ii)	<ul style="list-style-type: none"> <li>• thickener (1)</li> <li>• prevents retrogradation / syneresis / separation (1)</li> </ul> <p><i>Only acceptable answers</i></p> <p style="text-align: right;">(2x1)</p>	2
(a)(iii)	<ul style="list-style-type: none"> <li>• aids gel formation (1) of both custard and glaze (1)</li> <li>• prevents water loss (1) from custard and fruit (1)</li> <li>• tolerates acidic conditions (1) therefore suitable for glazing fruit (1)</li> <li>• excellent film producing qualities (1)</li> <li>• stabilises (1) - prevents separation (1)</li> <li>• holds water / binds / traps (1)</li> </ul> <p><i>Only acceptable answers</i></p> <p style="text-align: right;">(2x1)</p>	2
(b)	<ul style="list-style-type: none"> <li>• enhances water binding properties (1)</li> <li>• increases rate of gelling (1)</li> <li>• reduces discolouration of cut fruit (1)</li> <li>• produces tart taste / effects flavour (1)</li> <li>• ensures pH is constant, due to use of fruit (1)</li> </ul> <p><i>Only acceptable answers</i></p> <p style="text-align: right;">(4x1)</p>	4
<b>Total marks</b>		<b>10</b>

Question Number	Answer	Mark
5(a)	<p>Functional properties of additives:</p> <ul style="list-style-type: none"> <li>• physical characteristics e.g. modifying texture (1)</li> <li>• sensory characteristics e.g. colour, flavour, mouthfeel (1)</li> <li>• storage life e.g. preservatives (1)</li> <li>• nutritional status e.g. iron in breakfast cereals (1)</li> <li>• aid to processing e.g. anti-caking agent to produce free-flowing powders (1)</li> </ul> <p><i>Accept named functional property and/or example. Only answers</i></p> <p style="text-align: right;">(2x1)</p>	2
(b)(i)	<p>Use of xanthan gum in sauces:</p> <ul style="list-style-type: none"> <li>• thixotropic properties (1)</li> <li>• thins when agitated and thickens on standing (1)</li> <li>• produces excellent mouthful (1)</li> <li>• allows rapid flavour release / taste (1)</li> <li>• allows for easy removal from container (1)</li> <li>• thickens / prevents separation (1)</li> <li>• aids production (1)</li> <li>• absorbs water (1)</li> </ul> <p><i>Only acceptable answers</i></p> <p style="text-align: right;">(4x1)</p>	4

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

Question Number	Answer	Mark
5(b)(ii) con't	<p><b>Sensory characteristics:</b>  <b>Name:</b>            Flavouring - natural / synthetic: use of herbs / spices, essential oils / enhancers / sweeteners (1)  <b>Effect:</b>            replace/enhance flavour lost in processing (1)</p> <hr/> <p><b>Name:</b>            Colouring - natural / synthetic: plant colours: carotenoids / chlorophylls / anthocyanins / cochineal red (conchilla beetle) / food dyes (1)  <b>Effect:</b>            replaces colour lost in processing / enhances appearance / makes product appealing / colour/flavour association (1)            mouthfeel: see answer for physical characteristics</p> <hr/> <p><b>Storage life:</b>  <b>Name:</b>            Preservatives: sorbic / benzoic acid / potassium nitrate / sodium nitrite / sulphur dioxide (1)            Antioxidants: Vitamin C / Vitamin E / BHA / gallates (1)  <b>Effect:</b>            Preservatives: extend storage life of foods (1)            reduce wastage through spoilage by micro-organisms / prevents certain bacteria from growing (1) -            Antioxidants: prevents oxidation of fats and rancidity (1)</p> <hr/> <p><b>Nutritional status:</b>  <b>Name:</b>            Nutrients: Vit. A, D,C,B group, iron, calcium, zinc (1)  <b>Effect:</b>            use can be technological e.g. anti-oxidant / fortification by law (1)</p> <hr/> <p><b>Aid to processing / facilitates the production of a food stuff</b>  <b>Name:</b>            (i) solvents used to extract substances (1)            (ii) filter aids (1)            (iii) anti-caking agent (1)  <b>Effect:</b>            (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)</p> <p style="text-align: right;">(2x1) (2x1)</p>	4
<b>Total marks</b>		<b>10</b>

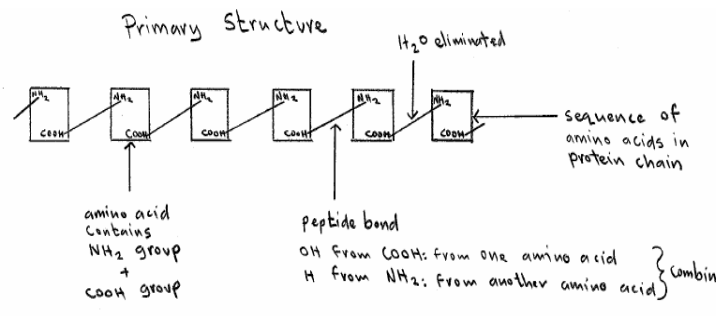
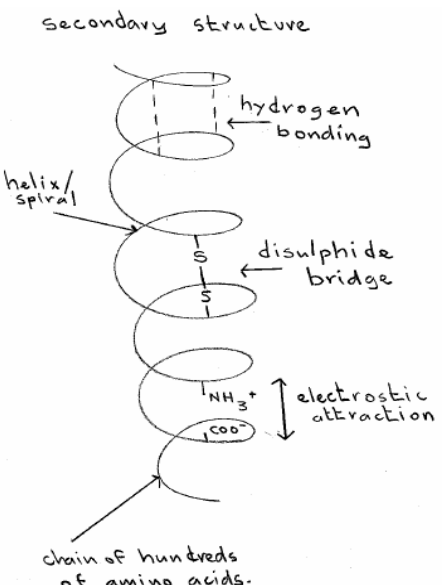
Question Number	Answer	Mark
6(a)	<p>Micro-organisms of particular significance are:</p> <ul style="list-style-type: none"> <li>• Bacteria / bacterium (1)</li> <li>• Moulds / Fungi (1)</li> <li>• Yeasts (1)</li> </ul> <p><i>Only acceptable answers</i></p> <p style="text-align: right;">(3x1)</p>	3
(b)(i)(ii)(iii)	<p><b>Name of bacterium</b></p> <ul style="list-style-type: none"> <li>• <i>Salmonella</i> (1)</li> </ul> <p><b>Food poisoning caused</b></p> <ul style="list-style-type: none"> <li>• cause an infective type of illness (1)</li> </ul> <p><b>Sources</b></p> <ul style="list-style-type: none"> <li>• found in intestines of man and animals(1)</li> <li>• spread by cross-contamination (1)</li> </ul> <p><b>Foods</b></p> <ul style="list-style-type: none"> <li>• eggs, egg products, poultry, meat and meat products (1)</li> </ul> <hr/> <p><b>Name</b></p> <ul style="list-style-type: none"> <li>• <i>Clostridium perfringens</i> (1)</li> </ul> <p><b>Food poisoning caused (1)</b></p> <ul style="list-style-type: none"> <li>• illness caused by consuming live bacteria which release toxin in intestines (1)</li> </ul> <p><b>Sources</b></p> <ul style="list-style-type: none"> <li>• found in intestine of man and animals (1)</li> <li>• spores can survive in dirt (1)</li> <li>• flies and bluebottles heavily infected (1)</li> </ul> <p><b>Foods</b></p> <ul style="list-style-type: none"> <li>• cold and reheated meat and poultry, mince and stews, foods cooked in bulk (1)</li> </ul> <hr/> <p><b>Name</b></p> <ul style="list-style-type: none"> <li>• <i>Staphylococcus aureus</i> (1)</li> </ul> <p><b>Food poisoning caused</b></p> <ul style="list-style-type: none"> <li>• toxin released into food, bacteria killed by heat but toxin is heat resistant (1)</li> </ul> <p><b>Sources</b></p> <ul style="list-style-type: none"> <li>• found in human skin, nose, throat, boils, transferred by hands, cross-contamination (1)</li> </ul> <p><b>Foods</b></p> <ul style="list-style-type: none"> <li>• cold meats, reheated meats, milk and milk products, un-pasteurised cheese (1)</li> </ul>	

Question Number	Answer	Mark
6(b)(i)(ii)(iii)	<p><b>Name</b></p> <ul style="list-style-type: none"> <li>• <i>Bacillus cereus</i> (1)</li> </ul> <p><b>Food poisoning caused</b></p> <ul style="list-style-type: none"> <li>• produces heat resistant exotoxin which is released into food (1)</li> </ul> <p><b>Sources</b></p> <ul style="list-style-type: none"> <li>• found in soil, dust, water, cereal foods (1) e.g. rice, cornflour</li> </ul> <p><b>Foods</b></p> <ul style="list-style-type: none"> <li>• rice dishes, cornflour sauces, milk puddings, spices (1)</li> </ul>	
	<p><b>Name</b></p> <ul style="list-style-type: none"> <li>• <i>Clostridium botulinum</i> (1)</li> </ul> <p><b>Food poisoning caused</b></p> <ul style="list-style-type: none"> <li>• produces exotoxin while growing in food (1)</li> <li>• lethal toxin (1), death rate 50%, outbreaks rare (1)</li> </ul> <p><b>Source</b></p> <ul style="list-style-type: none"> <li>• found in soil, marine mud, freshwater lake bed, in some fish and vegetables(1)</li> </ul> <p><b>Foods</b></p> <ul style="list-style-type: none"> <li>• canned, bottled, vacuum packed products, centre of large sausages and cheeses (1)</li> </ul>	
	<p><b>Name</b></p> <ul style="list-style-type: none"> <li>• <i>Escherichia coli</i> (<i>E.coli</i>) (1)</li> </ul> <p><b>Food poisoning caused</b></p> <ul style="list-style-type: none"> <li>• presence in food or water is used as an indication of faecal contamination (1)</li> <li>• 0157 pathogenic (1), cause for concern (1)</li> <li>• infection (1)</li> </ul> <p><b>Sources</b></p> <ul style="list-style-type: none"> <li>• found in intestines of man and animals (1)</li> </ul> <p><b>Foods</b></p> <ul style="list-style-type: none"> <li>• undercooked beef products, cook-chill foods, cheese(1)</li> </ul>	

Question Number	Answer	Mark
6(b)(i)(ii)(iii)	<p><b>Name</b></p> <ul style="list-style-type: none"> <li>• <i>Listeria monocytogenes</i> (1)</li> </ul> <p><b>Food poisoning caused</b></p> <ul style="list-style-type: none"> <li>• bacteria produces a toxin which enters the blood stream (1)</li> <li>• food not only vehicle of infection (1)</li> <li>• usually considered a food-borne illness rather than food poisoning (1)</li> </ul> <p><b>Sources</b></p> <ul style="list-style-type: none"> <li>• found in soil, water, intestines of animals, raw chicken, untreated milk (1)</li> </ul> <p><b>Foods</b></p> <ul style="list-style-type: none"> <li>• untreated dairy and meat products, salads, vegetables, seafood (1)</li> </ul> <hr/> <p><b>Name</b></p> <ul style="list-style-type: none"> <li>• <i>Campylobacter jejuni</i>, (<i>C.coli</i> / <i>C lari</i>) (1)</li> </ul> <p><b>Food poisoning caused</b></p> <ul style="list-style-type: none"> <li>• infective illness</li> </ul> <p><b>Sources</b></p> <ul style="list-style-type: none"> <li>• found in intestines of animals, including domestic and farm, poultry, meat, shellfish, milk (1)</li> </ul> <p><b>Foods</b></p> <ul style="list-style-type: none"> <li>• undercooked poultry, un-pasteurised milk, meat, shellfish, can be spread from person to person or animal to person (1)</li> </ul> <p style="text-align: right;">(1x1) (1x1) (2x1)</p>	4

Question Number	Answer	Mark
6(c)	<p>Any five from the following seven basic concepts in HACCP:</p> <ul style="list-style-type: none"> <li>• analysis of the process - (usually a flow diagram, identify hazards, control and prevention) (1)</li> <li>• recognise CCPs - (particular care has to be concentrated in implementing prevention -(measures) (1)</li> <li>• decide on target levels - (prevention and control measures are identified for each CCP, setting critical levels) (1)</li> <li>• develop a monitoring system - (observations, measurements to ensure preventative measures are implemented correctly) (1)</li> <li>• establish a corrective action - (corrective action plan if problem with preventative measures) (1)</li> <li>• install a verification process - (microbial examination and analysis, vital role in verification) (1)</li> <li>• develop documentation - (HACCP to work efficiently, efficient and accurate documentation) (1)</li> </ul> <p style="text-align: right;">(5x1)</p>	5
<b>Total marks</b>		<b>12</b>

Question Number	Answer	Mark
7(a)	advantages of freeze drying are: <ul style="list-style-type: none"> <li>• little shrinkage in product (1)</li> <li>• fewer flavour changes (1)</li> <li>• no case hardening (1)</li> <li>• good re-hydration characteristics (1)</li> <li>• produces a high quality product (1)</li> <li>• little nutrient loss (1)</li> </ul> <p><i>Only acceptable answers</i></p> <p style="text-align: right;">(4x1)</p>	4
(b)	A description that makes reference to the following points: <ul style="list-style-type: none"> <li>• product frozen (1) subjected to a strong vacuum (1)</li> <li>• small amount of heat by conduction, radiation heating or microwaves added without melting frozen material (1)</li> <li>• ice sublimates off as water vapour without melting (1)</li> <li>• sublimation process is accelerated (1)</li> </ul> <p><i>Only acceptable answer</i></p> <p style="text-align: right;">(4x1)</p>	4
(c)	spray drying process: <p>Candidates <b>must</b> make reference to the following:</p> <ul style="list-style-type: none"> <li>• a fine spray of the liquid product is produced by an atomizer (1)</li> <li>• spray enters chamber and is met by a blast of hot air (1)</li> <li>• moisture evaporates (1)</li> <li>• dried particles drop to bottom of drying chamber (1)</li> <li>• spray is dried into a fine powder within seconds (1)</li> </ul> <p><i>Candidates can also make reference to:</i></p> <ul style="list-style-type: none"> <li>• bacteria can survive process therefore it is necessary to heat process product before drying (1)</li> </ul> <p style="text-align: right;">(4x1)</p>	4
<b>Total marks</b>		<b>12</b>

Question Number	Answer	Mark
8(a)(i)	<p><b>Primary structure of protein:</b></p> <ul style="list-style-type: none"> <li>• arrangement of amino acids in protein chain (1)</li> <li>• <math>\text{NH}_2</math> (amine group) of one amino acid reacts with <math>\text{COOH}</math> (carboxyl group) from another amino acid to form a peptide link / bond with elimination of <math>\text{H}_2\text{O}</math> (1)</li> </ul> <p>A diagram is acceptable if explained.</p>  <p style="text-align: right;">(2x1)</p>	2
(ii)	<p><b>Secondary structure of protein:</b></p> <ul style="list-style-type: none"> <li>• primary structure is further linked to produce definite shape: helix / spiral (1)</li> <li>• further linking - <math>\text{SH}</math> group forms disulphide bridges (1)</li> <li>• links formed by hydrogen bonding (1)</li> <li>• electrostatic attraction between positively charged amino groups and negatively charged carboxyl groups (1)</li> </ul> <p>A diagram is acceptable if explained.</p>  <p style="text-align: right;">(4x1)</p>	4

Question Number	Answer	Mark
8(b)	<ul style="list-style-type: none"> <li>• classified by the protein's amino acid content / contains all essential (indispensable) amino acids / known as 'complete' protein (1)</li> <li>• classified as a High Biological Value (H.B.V.) protein / Low Biological Value (L.B.V.)protein (1)</li> <li>• capable of promoting growth and repair of tissue cells (1)</li> <li>• the body cannot synthesise and therefore obtained from diet (1)</li> <li>• combining proteins to increase biological value (1)</li> </ul> <p><i>Only acceptable answers</i></p> <p style="text-align: right;">(3x1)</p>	3
(c)	<p>Candidates <b>must</b> make reference to:</p> <ul style="list-style-type: none"> <li>• secondary structure of protein is altered (usually irreversible) primary structure remains unchanged (1)</li> <li>• involves the breaking of the cross-linkages which maintain shape of molecule (1)</li> <li>• changing structure (1)</li> </ul> <p>Candidates may also make reference to:</p> <ul style="list-style-type: none"> <li>• unfolded molecules bond with each other - resulting in coagulation (1)</li> <li>• enzymes (1) unable to carry out function (1)</li> <li>• enzymic activity (1) deactivated (1)</li> </ul> <p style="text-align: right;">(2x1)</p> <p><b>Factors:</b></p> <ul style="list-style-type: none"> <li>• action of heat (1)</li> <li>• presence of acid (1)</li> <li>• addition of salt (1)</li> <li>• addition of rennin (1)</li> <li>• mechanical action (1)</li> <li>• presence of alkalis (1)</li> <li>• ethanol (1)</li> </ul> <p style="text-align: right;">(1x1)</p>	3
<b>Total marks for question</b>		<b>12</b>
<b>Total marks for paper</b>		<b>80</b>