SCOTTISH QUALIFICATIONS AUTHORITY

2006 Product Design

Higher

Finalised Marking Instructions

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Higher Product Design Paper 2006
MARKING SCHEME

	Section A	
Question 1	**Answer Scheme**	**Marks**
(a)	The light unit must: • be stable • manufactured from durable materials that are suitable and appropriate for the lights function • be safe (complying to appropriate safety standards) and easy to use • ensure good ambient lighting (LAMPAN light only) • ensure directed lighting for reading purposes (FONOLIT light only) • aesthetics to suit the market niche • any other suitable statement. **six statements @ 1 mark each**	6
(b)	Statements which identify issues such as: • durability of material • strength issues • safety • suitability for production methods • aesthetic properties • any other suitable statement. Statements could include: 'The unit cost of the LAMPAN is very cheap because the materials used are easily mass produced by injection moulding. The reason why the cost must be kept low is because the style of the lamp would be aimed at a younger market that like quirky, colourful design but have a very limited budget. 'Steel tubing was used for the arm of the FONOLIT because it is cheap, strong and lightweight'. **four statements @ 1 mark each**	4
(c)	• Identification of the types or manufacturing processes used in the production of one of the illustrated products and how production processes relate to the materials used. • How manufacturing/assembly techniques are influenced by volume of production. Statements could include: Standardisation of sizes, component parts all the same size. Jointing methods suitable for mass/batch production – injection moulding, CNC, press forming, blanking/pressing/piercing etc. Standardisation of components in both lamps. Materials chosen because they are easily formed. Shape and form related to process. **Any six relevant issues about materials, processes and their relationships regarding suitability**	6

(d)	The manufacturer: • raw materials checked for quality • prompt delivery times (JIT) • health & safety issues • component accuracy • identification of quality in finished bought parts • project planning of assembly • any other acceptable issue. The consumer: • product meets legislation standards • assembly guidelines are clear if required • operating manual clear (Health and Hygiene etc) • guarantees provided • product is finished to a high standard • any other acceptable issue Statements such as: 'The manufacturer of the LAMPAN must ensure that the two part stem and base assembly snap fit easily by the consumer. Poor quality control regarding tolerances between these parts would mean that many units would be returned or recalled.' **Six issues identified for either the manufacturer or consumer, 6 issues @ 1 mark each**	6
(e)	Any four identified issues under the headings of: • cost • aesthetics • quality • corporate image/reputation. Statements such as: 'The LAMPAN unit costs £2.50 and therefore can be easily replaced as fashions and styles change, and is also suited to consumers on a limited budget.' **4 issues @ 1 mark each**	4
(f)	Any four issues explained and justified in the context of production, use and disposal for the product life cycle of these lighting units. Examples from: • chemical waste as a by product from manufacturing processes • planned obsolescence/landfill sites • health & safety manufacturing legislation • material decomposition issues. **4 statements @ 1 mark each**	4
	Total for Section A	**30**

	Section B	
Question	**Answer Scheme**	**Marks**
2 (a)	**WOODEN Breadbin** Functional Characteristics: • lid disappears into the back of the wooden bin and may take up storage space within the bin • track for lid could get stuck • less hygienic • needs less space overall because the bin lid is integrated into the design, so enabling it to fit into confined spaces. Aesthetic Characteristics: • real wood grain • traditional 'country' kitchen look/style • warm, natural colours • angular shape. **PLASTIC Breadbin** Functional Characteristics: • hygienic because it is easily cleaned • no crevices or corners that catch crumbs • portable and lightweight. Aesthetic Characteristics: • modern, minimalist shape • range of colour choices available to suit various kitchen styles and consumer tastes • soft, rounded, curvy looks. **2 marks for each bread bin. 1 mark functional and 1 mark aesthetic.**	4
(b)	• Size and type of bread products to be stored. • Other bread products people are likely to store. • Material properties and characteristics. • Space available on typical kitchen shelf/work surface/cupboard, etc. • Trends in kitchen styles and design. • Any ergonomic issues relating to reach, handle size, location or strength issues. • The target group. • Ideal storage conditions for bread storage **1 mark each for reasons 4 @ 1**	4
(c)	Answer must be a full description to attract marks. A list of criteria and main issues will not achieve any marks. • Supermarket questionnaires • Existing product analysis • Data sheets regarding material properties, ergonomics, etc • Observation analysis A sample answer could be: "Measure bread products available in the supermarket. The types of bread products measured should be selected because they are the types bought by the target group for the bread bin design." **2 marks for full reason given 2 @ 1**	2
	Total	**10**

3 (a)	Vacuum forming is suitable for the margarine tub because: • economies of scale: Large quantities can be produced, several thousand at a time from large, thin sheets • highly automated process using thin, low cost materials thus keeping costs down • low quality/simple design suited for throwaway/disposable items. Injection moulding is suitable for the food containers because: • the process is highly accurate and is required for snap fit lids • high volume production allows mass production of more variation of shapes and thicknesses • air tight seal made possible by using this process • textures can be applied. **1 mark each for reason. 2 marks each process**	4
(b)	Vacuum Forming: • constant material thickness • draft angle • rounded corners/edges • no undercuts • simple shapes/forms • lack of complex texture detailing. Injection Moulding: • split lines • sprue gate marks • sink and injection pin marks • complex shape/form • variation in material thickness. **1 mark each for process 2 @ 1**	2
(c)	Vacuum Forming: Polystyrene (PS) Injection Moulding: Polypropylene (PP) or High Density Polyethylene (HDPE) No other plastics are acceptable. **1 mark for each plastic 2 @ 1**	2
	Total	**8**
4	Explanation clarifying: • strength can be targeted at specific parts of the design to enhance performance • lightweight: Modern racquets are much lighter and durable due to the types of materials used. This means that the racquet head can be made much bigger and strung more tightly to ensure more power and accuracy • production methods are faster and more automated therefore the product is cheaper • quality issues: Quality is standardised and assured. Wood laminates may have undetected laminate flaws whereas modern plastic composites have more uniform properties. **2 marks for each advantage of composite materials 2 @ 2**	4
	Total	**4**

5(a)	• Standard lengths can be manufactured. • Uniform sections are produced. • Fixing recesses for components can be incorporated into the part. • Ease of assembly. • Takes less time to make as the extrusion process requires no further machining. • Simpler jointing and construction/assembly. • Variety of styles/finishes available. • Tolerances and fits. • Flat pack therefore construction can be done on site. • Any other valid reason to do with design using extruded parts eg strength issues etc. **1 mark each valid point made in description 3 @ 1**	3
(b)	• Strength to weight ratio changes. • Size of section needed must be increased, ie wall thickness of extruded parts. • Addition of webs to strengthen the sections. • Metal inserts could be incorporated to increase rigidity. • Cost implications, aesthetic and environmental reasons can be accepted but only if justified in the context of the question. For example the designer may have been asked to use plastic because the company has a corporate colour or the company wants to create colourful kiosks to attract customer attention. This is an example of aesthetic reasons for changing materials as plastic gives a better range of colours and requires minimal maintenance. **1 mark each valid point made in description 3 @ 1**	3
(c) (i)	Pressure Die Casting is the only accepted answer. **1 mark for correct process.**	1
(c) (ii)	Standard part that means there is no requirement to manufacture additional components as the same part can be used for both parts. No 'over-engineering' which can lead to overcomplicating the design. The answer that the candidate gives should allude to: • economies of scale • lower tooling costs • standardised components • easier assembly as there are less parts to have to know how to put together. **1 mark for acceptable answer**	1
	Total	**8 marks**

6(a)	(i) TECHNOLOGICAL OPPORTUNITY: • making uses in advances in technology to either improve products or create new ones. **1 mark** • example – Mobile phone was developed as a result of miniaturisation and use of microwaves in telecommunication. **1 mark** (ii) COMMERCIAL ENTERPRISE: • identification of new markets and opportunities to sell products. It involves giving a product an advantage in the marketplace to ensure reduced competition. **1 mark** • using new technology to put ceramic edges to kitchen knives thus ensuring innovative cost savings through the use of new materials and processes. **1 mark**	2 2
(b)	• *An in-house designer has no rights to the design.* The rights lie with the employer who will protect them by the use of patents and/or trademarks. • *A freelance or consultant designer may be able to protect his design by use of a patent* but as patents are in the public domain these ideas may be copied by other companies in other parts of the world. **1 mark for basic explanation (see *italics*) and 2 additional marks if the answer is extended to show deeper understanding of IP**	3
(c)	Obsolescence: New technological features become available eg cameras, emailing, MP3, PDA facilities. Design features regarding aesthetic appeal/fashion and style changes. Components break or wear out (planned obsolescence) eg screen/switches. **1 mark for each issue 3 @ 1**	3
	Total	**10**
	Total for Section B	**40**

[END OF MARKING INSTRUCTIONS]