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**DESIGN AND TECHNOLOGY**

**9705/33**

Paper 3

**October/November 2016**

MARK SCHEME

Maximum Mark: 120

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**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.

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## Section A

### Part A – Product Design

- 1 (a) Description of process
- fully detailed 3 – 5
  - some detail, 0 – 2
  - quality of sketches up to 2 7 × 2 [14]
- (b) Rotational moulding
- large hollow shape
  - excellent finish
  - minimal wastage – exact amounts used
- Turning
- regular cylindrical shape
  - high quality finish
  - shape easily repeated
- Etching
- accurate detail
  - relatively quick operation
  - needs minimal equipment/cost 3 × 2 [6]
- [Total:20]**
- 2 (a) Suitable material:
- appropriate straight grained hardwood
  - aluminium alloy
  - stainless steel
  - nylon/abs/polypropylene 1
- Reasons :
- can produce high quality finish
  - will gentle flex on bumpy conditions
  - easy to bend/press/shape 2 × 1 [3]
- (b) Description to include: shaping/forming/pressing finishing/laminating
- Quality of description:
- fully detailed 3 – 7
  - some detail 0 – 2
- Quality of sketches up to 2 [9]

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- (c) Explanation could include:
- change in process
  - change in materials
  - use of jigs, formers, moulds
  - simplification of design
- Quality of explanation:
- logical, structured 4 – 6
  - limited detail 0 – 3
- Quality of sketches up to 2 [8]

**[Total: 20]**

- 3 (a)** Tool identified and clear description 2 × 2 [4]
- (b)** Full description (no sketches max 3)  
Up to 2 key features described 0 – 2      3 – 4  
4 × 2 [8]
- (c)** Full description (no sketches max 3)  
Up to 2 key features described 0 – 2      3 – 4  
4 × 2 [8]

**[Total: 20]**

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### Part B – Practical Technology

- 4 (a) Toughness – The amount of energy a material can absorb before it breaks. The ability to withstand sudden impact.
- Elasticity – The ability of a material to absorb force and flex in different directions, returning to its original position.
- 2 × 1 [2]
- (b) Tough material – e.g. mild steel, duralumin, abs, polypropylene
- Elastic material – rubber, polypropylene, steel
- 2 × 1 [2]
- (c) Description to include: holding sample, application of tensile stress
- Quality of description:
- fully detailed 6 – 8
  - some detail 4 – 5
  - limited detail 0 – 3
- Quality of sketches up to 2 [10]
- (d) Explanation could include:
- functional requirements
  - safety limits
- Quality of explanation:
- logical, structured 4 – 6
  - limited detail 0 – 3 [6]
- [Total: 20]**
- 5 (a) Full description of mechanism 3
- Example 1
- For **three** mechanisms 3 × 4 [12]
- (b) Mechanical advantage – the ratio of the force produced by a machine to the input force applied to it.
- Velocity ration – the ratio of a distance through which any part of a machine moves to that which the driving part moves during the same time.  
(Effort: distance moved by effort)
- Quality of explanation:
- logical, structured 5 – 8
  - limited detail 0 – 4 [8]
- [Total: 20]**

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- 6 (a) Description should include:
- orientation of LED
  - heat sink on leg
  - clean track on PCB
  - position LED
  - heat joint area with tip of soldering iron
  - apply solder, wait for flow, remove solder, remove iron

Quality of description:

- fully detailed (most stages) 4 – 5
- limited detail 0 – 3

Quality of sketches up to 2 [7]

- (b) Description should include:
- details of mould
  - melt metal, pour into preheated mould
  - cool, remove, finish

Quality of description:

- fully detailed (most stages) 4 – 5
- limited detail 0 – 3

Quality of sketches up to 2 [7]

- (c) Explanation should include:
- welding uses heat to join similar materials by causing coalescence. This is done by melting the work-pieces and adding a filler material of similar consistency.
  - Hard soldering (e.g. silver soldering) uses a lower-melting-point material to join the work-pieces; the work-pieces are not heated to melting point.
  - Approximate melting temps
  - use of fluxes

Quality of explanation:

- logical, structured 4 – 6
- limited detail, 0 – 3 [6]

[Total: 20]

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### Part C – Graphic Products

<b>7</b>	Discussion should refer to:		
	– target market/research		
	– unit costs		
	– set up costs		
	– demand		
	– other commercial issues		
	Examination of issues		
	– wide range of relevant issues	5 – 9	
	– limited range	0 – 4	
	Quality of explanation		
	– logical, structured	4 – 7	
	– limited detail,	0 – 3	
	Supporting examples / evidence		
	– specific products		
	– specific marketing/commercial examples		
	– specific details of quantity production methods	4	
			<b>[Total: 20]</b>
<b>8</b>	<b>(a)</b> correct scale	2	
	correct isometric	2	
	semi-ellipse	3	
	semi circles	3	
	accuracy/quality	2	[12]
	<b>(b)</b> Explanation should include:		
	– planometric – $45^\circ \times 45^\circ$ , $60^\circ \times 30^\circ$		
	– perspective – one, two or three point		
	– appropriate usage		
	Quality of explanation:		
	– logical, structured	6 – 8	
	– some detail	4 – 5	
	– limited detail	0 – 3	[8]
<b>9</b>	<b>(a)</b> correct outline/orientation	3	
	correct scale	2	
	overall accuracy/quality	3	
	quality of rendering	2	[10]

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- (b) explanation should include:
- initial design ideas, quick sketch, quick flow of possibilities, OK to share with design team / client
  - working drawing – full detailed and dimensioned – enable 3<sup>rd</sup> party manufacture
  - presentation – high quality, photo ready, realistic, to clients / advertising

quality of explanation:

- logical, structured 8 – 10
- some detail 4 – 7
- limited detail, 0 – 3 [10]

**[Total: 20]**

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## Section B

### Analysis

Analysis of the given situation/problem. [5]

### Specification

Detailed written specification of the design requirements.  
At least five specification points other than those given in the question. [5]

### Exploration

Bold sketches and brief notes to show exploration of ideas for a design solution, with reasons for selection.

- range of ideas [5]
- annotation related to specification [5]
- marketability, innovation [5]
- evaluation of ideas, selection leading to development [5]
- communication [5]

### Development

Bold sketches and notes showing the development, reasoning and composition of ideas into a single design proposal. Details of materials, constructional and other relevant technical details.

- developments [5]
- reasoning [5]
- materials [3]
- constructional detail [7]
- communication [5]

### Proposed solution

Produce drawing/s of an appropriate kind to show the complete solution.

- proposed solution [10]
- details/dimensions [5]

### Evaluation

Written evaluation of the final design solution. [5]

**[Total: 80]**