
DESIGN AND TECHNOLOGY**9705/31**

Paper 3

October/November 2016

MARK SCHEME

Maximum Mark: 120

Published

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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

7	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	
			[Total: 20]
8	(a) correct scale	2	
	correct isometric	2	
	semi-ellipse	3	
	semi circles	3	
	accuracy/quality	2	[12]
	(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]
9	(a) 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 3rd 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]