Cambridge International A Level

Cambridge International Examinations
Cambridge International Advanced Level

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]

(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) — 3 – 4
Up to 2 key features described — 0 – 2 — 4 × 2 [8]

(c) Full description (no sketches max 3) — 3 – 4
Up to 2 key features described — 0 – 2 — 4 × 2 [8]

[Total: 20]

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]

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]

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 – 45º × 45 º, 60 º × 30 º
- 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]

(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]

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]