UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the October/November 2009 question paper for the guidance of teachers

9705 DESIGN AND TECHNOLOGY

9705/31 Paper 31 (Written 2), maximum raw mark 120

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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UNIVERSITY of CAMBRIDGE
International Examinations

Section A

Part A – **Product Design**

1 **(a)** Appropriate material including:
- Aluminium/copper or similar sheet metal
- Acrylic/ABS/polypropylene or similar plastic
- Specific hardwood (1)

Reasons including:
- takes a good finish/easy to form/shape
- attractive
- easy to clean (2 × 1) [3]

(b) Description to include:
- appropriate method
- marking, shaping, turning, forming

Quality of description:
- fully detailed (3–6)
- some detail (0–2)

Quality of sketches (up to 2) [8]

(c) Explanation could include:
- change in process
- change in materials
- use of jigs, formers, moulds
- simplification of design

Quality of explanation:
- logical, structured (4–7)
- limited detail (0–3)

Quality of sketches (up to 2) [9]

[Total: 20]

2 **(a)** Reasons could be
demand
simple design
very little assembly
minimal processes

For 3 reasons (3 × 1) [3]

(b) Reasons could be
wide range of size and style
will wear out, new ones needed
fashion/trends

For 2 reasons well explained (2 × 2) [4]

(c) Products could be
bespoke furniture
specialist clothing e.g. wedding dresses
large structures e.g. buildings, bridges
designer jewellery

For three products (3 × 1) [3]

(d) Discussion could include
equipment – cost, maintenance, power requirements, range
assembly – number of parts/operations, use of bought in/standardised parts, skill level required
labour skills – complex operations, range of processes, training requirements, pay issues
Range of issues covered (3 × 2 marks)
Quality of discussion/examples (4) [10]

[Total: 20]

3 **(a)** Description of process
- fully detailed (3–5)
- some detail, (0–2)

Quality of sketches (up to 2)
(7 × 2) [14]

(b) Profile forming
- one step production, very quick
- consistent section
- high quality finish

Compression moulding
- excellent finish
- high tolerance level (must fit)
- moulds thermosetting plastic

Extrusion
- no wastage
- exceptionally quick/consistent standard
- grain structure enhanced

(3 × 2) [6]

[Total: 20]

Part B – **Practical Technology**

4 **(a)** **(i)** Elastic region [2]

(ii) Limit of proportionality/elastic limit/yield point [2]

(iii) Ultimate tensile strength [2]

(iv) Fracture/break point [2]

(b) Properties could be
Ductility (1) ability to be drawn (2)
Stiffness (1) to keep shape, hold paper (2)
Yield stress (1) strong enough to keep shape (2)
For two properties explained (2 × 3) [6]

(c) Simple test showing
- secure one end of sample (1)
- mechanism to rotate other end (2)
- record force/effect (1)

Quality of communication (2) [6]

[Total: 20]

5 (a) (i) 1 kΩ [1]

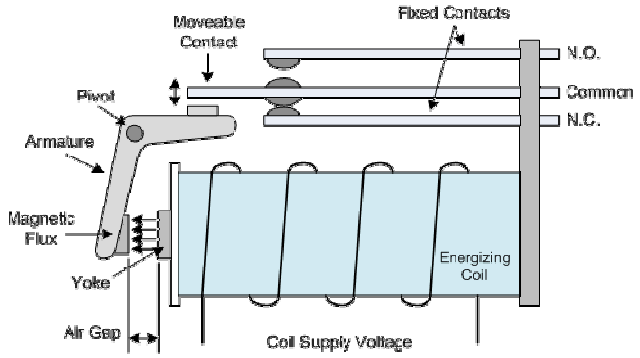
(ii) 0.36 μA [1]

(iii) 0.07 A [1]

(b) (i) 60 W (1) with calculation P = V × I (1) [2]

(ii) $I = \frac{P}{V}$ (1) current = 12 A (1) resistance = 250/12 = 20.8 Ω (or 21 Ω) (1) [3]

(c) Relay – Switch to turn other circuits on or off
Current to movement (solenoid)
Small current controls large current

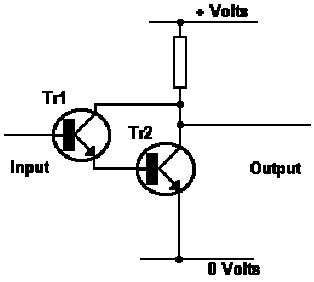


Example – audio amplifier, machine control

Micro switch – Switch requiring little force to activate
Safety/shut off device
Very small/unobtrusive

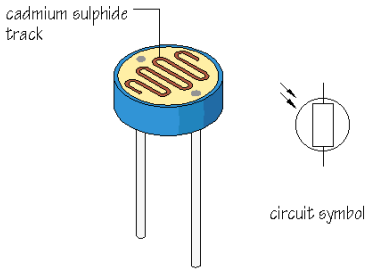
Example – fridge light

Darlington Pair – Used in sensor circuits
Uses 2 transistors
Amplifies weak signals



Example – temperature sensor

LDR – Light Dependent Resistor – resistance decreases with increasing light
Photoconductor device
Sensors/safety systems



Example – camera light meter, street lighting

Description/function (3)
Example (1)
For three well described components with example (4 × 3) [12]

[Total: 20]

6 Full description of mechanism (3)
Example (1)
For five mechanisms (5 × 4) [20]

[Total: 20]

Part C – **Graphic Products**

7 Explanation of when and why (3)
Example (1)
For five explanations and examples (5 × 4) [20]

[Total: 20]

8 **(i)** Correct shaft diameter [1]

(ii) In line wedge [1]

(iii) Min distance [1]

(iv) Anti clockwise [1]

(v) 0–120 uniform [4]

(vi) Dwell [1]

(vii) 180–360 SHM [5]
Displacement diagram [4]
Quality of communication/accuracy [2]

[Total: 20]

9 Correct isometric [3]
Approx full size [2]
Quality of linework [4]
Overall shape/proportion [7]
Rendering chrome [2]
Matt texture [2]

[Total: 20]