

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**GCE Advanced Level**

**MARK SCHEME for the October/November 2013 series**

**9705 DESIGN AND TECHNOLOGY**

**9705/31**

Paper 3, 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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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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) welding

- very strong joint
- can used to fabricate components of similar material
- relatively quick process

## jointing

- structurally strong
- can be aesthetic
- effective for joining wood parts

## Laying up with GRP

- compound shape/easy once mould made
- structurally strong/resists loads
- colour applied

3 × 2 [6]

**[Total: 20]**

## 2 (a) suitable material including:

- aluminium/brass
- ABS/nylon
- Mild steel
- appropriate hardwood

1

## Reasons including:

- rigid
- easy to shape
- accepts good finish

2 × 1 [3]

## (b) description to include:

## quality of description:

- fully detailed
- some detail,
- quality of sketches

3 – 7

0 – 2

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** Discussion could include:
- range of sizes/models;
  - adjustability (car seats);
  - flexibility (clothing)
  - use of anthropometric data
- 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
- watches,
  - clothes
  - chairs
  - spectacles 4
- [Total: 20]**

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Part B – Practical Design

- 4 (a) ways could be:
- CAD
  - Internet (research, comparisons)
  - communication in design teams

- benefits could be:
- speed/quality of design presentation
  - accuracy
  - up to date info on competitors

- quality of description
- logical, structured/detailed 2 – 3
  - limited detail, 0 – 1

benefits up to 2 (5 × 2) [10]

- (b) ways could be:
- CAM (CNC machining)
  - quality control
  - stock control

- benefits could be:
- high speed manufacture
  - no labour issues
  - consistency of product
  - quality assurance

- quality of description
- logical, structured/detailed 2 – 3
  - limited detail, 0 – 1

benefits up to 2 (5 × 2) [10]

[Total: 20]

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5 (a) **Reed Switch**

When a magnetic force is generated parallel to the reed switch, the reeds become carriers in the magnetic circuit. The overlapping ends of the reeds become opposite magnetic poles, which attract each other. **If the magnetic force between the poles is strong enough to overcome the restoring force of the reeds, the reeds will be drawn together.**

**Light Dependent Resistor LDR**

**A photoresistor or light dependent resistor LDR is a resistor whose resistance decreases with increasing incident light intensity.**

**Strain gauge**

**is a device used to measure the strain of an object.** The most common type of strain gauge consists of an insulating flexible backing which supports a metallic foil pattern. The gauge is attached to the object by a suitable adhesive, such as cyanoacrylate. As the object is deformed, the foil is deformed, causing its electrical resistance to change. This resistance change, usually measured using a Wheatstone bridge, is related to the strain by the quantity known as the gauge factor.

**Transistor**

**is a semiconductor device used to amplify and switch electronic signals and power.** It is composed of a semiconductor material with at least three terminals for connection to an external circuit. A voltage or current applied to one pair of the transistor's terminals changes the current flowing through another pair of terminals. Because the controlled (output) power can be much more than the controlling (input) power, a transistor can amplify a signal.

Name

1 mark

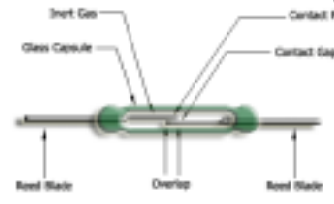
Description

1 mark (2 × 4) [8]

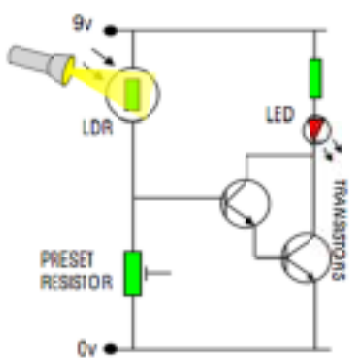
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(b) Applications

Reed switch security devices, alarms



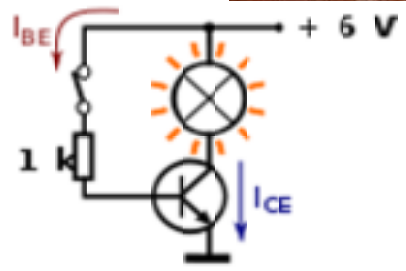
LDR light sensing circuits



Strain gauge structures, bridges, buildings  
Gap or extension checking



Transistor switch, amplifier



Appropriate application  
Explanation

1 mark  
up to 2 marks (3 × 4) [12]

[Total: 20]

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- 6 (a) X small amount of elasticity  
 little ductility/brittle  
 sudden fracture  
 e.g. cast iron
- Y good ductility  
 Clear elastic limit  
 Some stretching  
 e.g. mild steel
- Z extremely ductile  
 Not brittle  
 very stretchy under limited load  
 e.g. copper 2 × 3 [6]
- (b) appropriate test for impact 1 mark  
 quality of description up to 3  
 quality of communication up to 2 [6]
- (c) Specific test
- |                     |                                  |  |
|---------------------|----------------------------------|--|
| X ray testing       | e.g. welded joints               |  |
| Ultra sonic testing | e.g. strain in ceramics/plastics |  |
- test 1  
 example 1
- Importance
- Often expensive components tested
  - Checks internal flaws
  - Accurate predictor of material/component performance
- quality of explanation 4 – 6
- logical, structured 0 – 3 [8]
  - limited detail,
- [Total: 20]**

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### Part C – Graphic Products

#### 7 Discussion could include:

- technical/functional factors
- importance of visual impact to attract interest/sales
- specific product use
- chosen material/finish/texture
- colour and fashion trends

#### 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

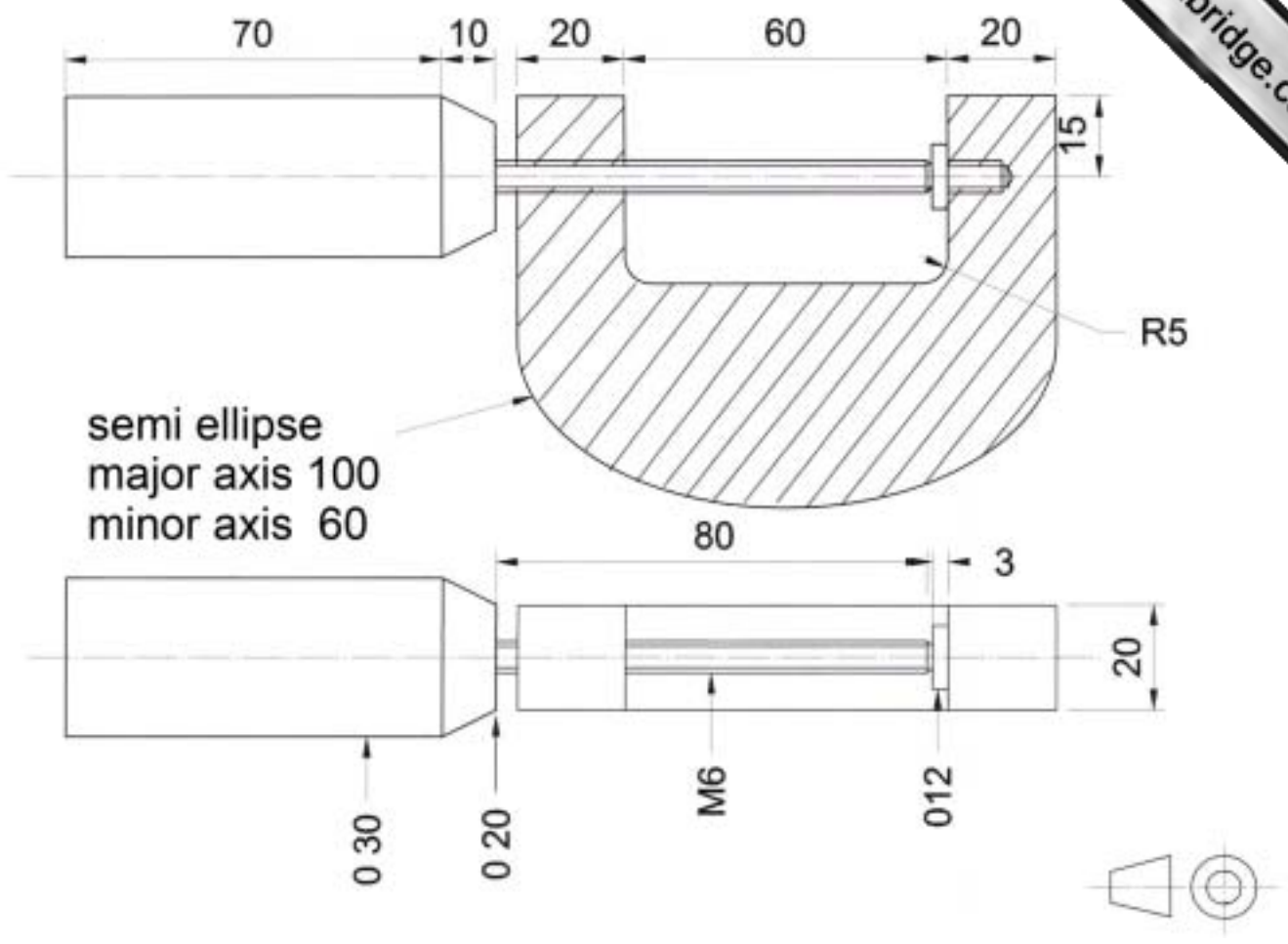
- Specific products e.g. space for essential working components
- Packaging features
- specific finishes 4

**[Total: 20]**



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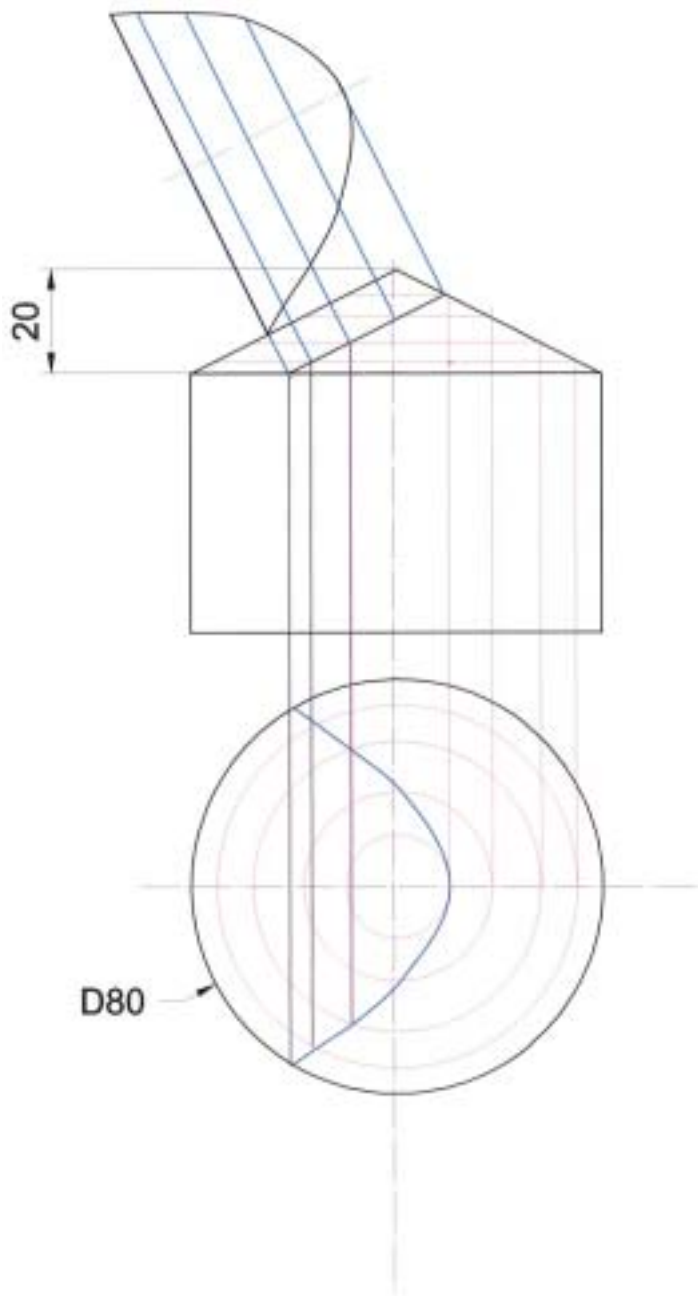
8



- (a) correct sectional elevation 5  
 correct plan 3  
 scale/projection 2  
 construction 3  
 quality/accuracy 3 [16]
- (b) ways could be:  
 – knurling  
 – splined  
 – reshaped handle  
 2 × 2 [4]
- [Total: 20]

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- (a) correct plan  
accuracy/line quality 3  
2 [5]
  
- (b) parabolic true shape  
accuracy/line quality 3  
2 [5]
  
- (c) appropriate connection method  
e.g. tabs, interlocking system  
lid operation up to 3  
up to 4  
quality of communication up to 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]**