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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2012 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.
Section A

Part A – Product Design

1 (a) description of process
   – fully detailed
   – some detail
   quality of sketches

(b) extrusion
   – long lengths produced
   – regular section
   – no wastage

blow moulding
   – large hollow shape
   – very fast production rate
   – excellent finish
   – minimal wastage

turning
   – regular cylindrical shape
   – high quality finish
   – shape easily repeated

2 (a) cutting action clearly described
   quality of sketch

   eg.

   (b) detailed description
   quality of sketches
3 (a) appropriate material including:
- Laminated specific hardwood
- Acrylic/HIPS
- Aluminium/copper

Reasons including:
- Bend to shape easily;
- Takes good finish
- Easy to cut shapes out

2 × 1 [3]

(b) description to include:
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]

Part B – Practical Design

4 (a) (i) \[ R = \frac{V}{I} = \frac{12}{3} = 4 \Omega \] (1 mark) 1 [2]

(ii) \[ I = \frac{V}{R} = \frac{9}{40} = 0.225 \text{mA} \] (2 marks) 1 [3]

(iii) \[ V = IR = 150 \mu A \times 30000 = 4.5 \text{v} \] (1 mark) 1 [3]

(b) issues could be:
- more products, consumer choice, new potential;
- marketing implications;
- cost;

examination of issues
- wide range of relevant issues 4 – 5
- limited range 0 – 3

quality of explanation
- logical, structured 3 – 5
- limited detail 0 – 2
supporting examples/evidence:
- mobile phones,
- computing,
- media

5 (a) crank fully described
Product

(b) linkage fully described
Product

(c) cam fully described
Product

(d) worm and worm wheel fully described
Product

6 (a) materials, reasons and applications could be:
- teak
  application – garden furniture
  oils reduce degradation
- aluminium
  application – buildings
  oxide layer forms and protects aluminium
- cedar
  application – garden fences, sheds
  oils reduce degradation
- copper (brasses and bronzes)
  application – sculpture, door furniture
  does not oxidise quickly
- lead
  application – roof protection
  does oxidise quickly
- PVC (uPVC)
  application - conservatories, garden furniture
  polymer resistant to ultra violet light, does not react to water
- Acrylic (PMMA)
  polymer fairly resistant to ultra violet light, does not react to water

Application – shop signs

Material 1 mark
reason 1 mark
application 1 mark

3 × 2 [6]

(b) quality of description
- fully detailed, well communicated
  3 – 4
- some detail, one method described
  for one specific wood and one specific metal
  0 – 2
  4 × 2 [8]

(c) quality of explanation:
- logical, structured
  4 – 6
- limited detail
  0 – 3 [6]
Part C – Graphic Products

7 Correct isometric scale 2
detail  – positioning 2
– base 3
– upright 2
– ellipse 4
– recess 2
Quality of line/construction 3 [20]

8 Discussion could include:

Quality control
– no errors
– QC throughout operation
Manufacturing
– reduce components
– update
CAD/CAM
– speed up process; drawing to machine capability; research component availability
– 24/7 production potential

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
– modifying/upgrading rather than creating new (cars, mp3, 4, phones)
– rapid prototyping,
– Dyson (injection moulding, shared components)
– other specific products 4 [20]

9 (a) (i) 3rd angle (1 mark) sectional, orthographic projection (1 mark for sectional or orthographic) [2]

(ii) accurate/scaled
fully dimensioned
agreed standard 2 × 2 [4]

(b) grip/length/width
thumb/finger operation of buttons/size

description of example 2
sketch 1
3 × 2 [6]
(c) discussion could include:

- research target group – advertising
- cost
- placement of product

examination of issues 3
quality of explanation 3
supporting examples/evidence 2 [8]

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]