

# GCE 2004

## *June Series*



## Mark Scheme

### Design and Technology: Product Design *(Subject Code PD6D)*

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Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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Publications Department, Aldon House, 39, Heald Grove, Rusholme, Manchester, M14 4NA  
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*Dr Michael Cresswell Director General*

# Design and Technology: Product Design

## 3D Design (PD6D)

### *Quality of Written Communication*

The following marks are allocated to the quality of the candidate's written communication. Make a separate assessment of the candidate's overall ability as demonstrated across the paper using the criteria given below.

<i>Performance Criteria</i>	Marks
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The candidate will express complex ideas extremely clearly and fluently. Sentences and paragraphs will follow on from one another smoothly and logically. Arguments will be consistently relevant and well structured. There will be few, if any, errors of grammar, punctuation and spelling.	4
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The candidate will express moderately complex ideas clearly and reasonably fluently, through well-lined sentences and paragraphs. Arguments will be generally relevant and well structured. There may be occasional errors of grammar, punctuation and spelling.	3
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The candidate will express straightforward ideas clearly, if not always fluently. Sentences and paragraphs may not always be well connected. Arguments may sometimes stray from the point or be weakly presented. There may be some errors of grammar, punctuation and spelling, but not such as to suggest a weakness in these areas.	2
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The candidate will express simple ideas clearly, but may be imprecise and awkward in dealing with complex or subtle concepts. Arguments may be of doubtful relevance or obscurely presented. Errors in grammar, punctuation and spelling may be noticeable and intrusive, suggesting weaknesses in these areas.	1
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**NB** This mark scheme is intended as a guide to the type of answer expected but is not intended to be exhaustive or prescriptive. If candidates offer other answers which are equally valid **they must be given full credit.**

Many responses at this level are assessed according to the **quality** of the work rather than the number of points included. The following level descriptors are intended to be a guide when assessing the quality of a candidate's response.

<b>(low mark range)</b>
The candidate has a basic but possibly confused grasp of the issues. Few correct examples are given to illustrate points made. Description may be unclear.
<b>(mid mark range)</b>
The candidate has some knowledge but there will be less clarity of understanding. Some correct examples given to illustrate points made. Description better but unclear or confused in parts.
<b>(high mark range)</b>
The candidate has a thorough understanding of the issues and has provided relevant examples to support the knowledge shown. This candidate's answer shows clear evidence of understanding.

## Section A Materials and Components

### Question A1

Ensure that candidates follow rubric –  
name specific product/one from each of two areas  
answers should cover both materials and process of manufacture

- range of products – *anticipate*:  
tennis rackets, skis, sports footwear, balls – golf – soccer, even “astroturf”  
car bodies – Audi aluminium/GRP Lotus sports cars/Smartcar moulded thermoplastic bumpers  
Dyson cleaners, electric tools – Black & Decker, food processors, etc.
- no marks for simply generic name of a product, but credit specific products as suggested above up to 12 marks for each item/product  
answers should refer to:
  - use of composites/FRP plastics/carbon fibre, alloys – smart materials etc.
  - new materials provide benefits of low cost, precision moulding – injection/rotation etc.
  - self finishing plastics
  - specific strengths – impact, durability
  - weight reduction due to use of moulded thermoplastic polypropylene etc.
  - manufacture processes – volume production via mouldings use of dyes.

Non specific, general points such as cheap to manufacture should not be awarded marks.

(2 x 12 marks)

**Total 24 marks**

### Question A2

- (a)
- 2 marks for correct and specific name of material and reference to the requirement for a finish, no marks for generic names
  - 7 marks for each description of different finishes. Do not accept paint and varnish as being sufficiently different to award second set of marks
  - Differentiate according to detail in description, type of paint/varnish etc, appropriate/factual details given for plating, anodising, galvanising, plastic coating etc.
  - Brief reasons for the relevant application e.g. prevents oxidation, seal against ingress of moisture or chemicals, repels insect/fungal attack. Heat proof surface. Remedial maintenance – wipe clean.
  - Reference made to the aesthetic contribution made by finish. (2 x 8 marks)
- (b)
- 2 marks for specific named product
  - 6 marks for details such as provision of a colour, texture, matt or reflective surface
  - appearance enhanced for style, fashion or technical reasons such as safety, camouflage.

Footnote is given to provide a lead with suggestions for details which should be addressed.

(8 marks)

**Total 24 marks**

## Section B Design and Market Influences

### Question B3

Essay style which should include annotated sketches in order to provide necessary detail of the examples used by candidates in order to demonstrate the importance of style.

- Examples must be sufficiently different so that separate issues can be made
- Fashion/clothing, furniture, automobiles, architecture, domestic products
- Reference should be made to use of form/shape, proportion, colour, applied decoration
- E.g. Dyson DC10 – range of colour schemes – yellow/grey, mauve/pink
  - transparent collection box
  - hi-tech image of product – cyclone effect promoted through advertising

12 marks available for each product – description of product, use of sketches should account for 4 marks, remainder – 8 marks awarded for explanation of aesthetic appeal.

(2 x 12 marks)

**Total 24 marks**

### Question B4

Candidates may not be familiar with term – sustainability and Ecodesign web, however the terms and details given should provide sufficient lead to the requirements or the question.

Accuracy/specific measurable values and detail is not necessary but appropriate reference to such issues as

- Extraction/preparation/refinement of raw material
- Durability and necessary maintenance
- Hazards – to environment before, during manufacture and use/end of use
- Use of energy before, during manufacture and in order to carry out –
- recycle, renewable, reuse, processes/methods
- distribution, ease of distribution – transport distance/type, packaging needs

Although there are 6 specific areas to consider these do not have a hierarchy or specific allocation of marks – 24 marks available overall, answers may/may not be broken into sub parts. May be essay style answer or answered in chart form.

(24 marks)

**Total 24 marks**

## Section C Processes and Manufacture

### Question C5

- (a) **NB** Do not be critical regarding definitions of Quality Control/Quality Assurance. Note Quality Control is carried out in order to guarantee Quality Assurance.
- **Quality control** defined to be techniques for checking against a set standard or within a tolerance, inspection during stages of manufacture and at completion
  - Use of jigs, gauges, automated machinery, CNC – CAD, CAM inspection testing, sampling
  - **Quality assurance** planned and systematic actions/procedures to ensure that the product meets quality standards, QA takes place before, during and after the even of manufacture but is designed to *prevent* failure. E.g. right first time/every time quality built into a process of manufacture
  - Use of specifications for product, materials/components supplied, machine tolerancing
  - In both cases reference to how these systems described should/would lead to quality of specific products is necessary. This should avoid generalised statements which would not generate high order marks.

(2 x 8 marks)

- (b) Various methods relevant to specific product, which must be named

- Provision of fuse/circuit trip
- Insulated heavy duty flexible cable
- Low voltage power supply/use of re-charge batteries
- Double insulated casings
- Plastic non-conductive body casings
- Cordless – kettles
- Switch gear – dead men's handle trigger switch, micro-safety-switch
- Movement indicator
- Plastic blades

(8 marks)

**Total 24 marks**

### Question C6

- (a) **Primary research** – direct, personal involvement

- Contact with experts
- Communication with client
- Market research – questionnaires
- Fieldwork – visits to museums, exhibitions
- Modelling, including computer simulation
- Testing and experimentation

**Secondary research** – background research

- Reference to books, magazines, catalogues, promotional media
- Data sheets
- Internet – websites etc.

(16 marks)

(b) It is important that candidates recognise the value and importance of evaluation throughout the design process and through reference to own work. Do not accept simple generalisations.

- Evaluation of the initial need/brief
- Analysis of the primary/secondary research – generation of a specification
- Consideration of first ideas leading to further research which requires evaluation
- Appraisal of models and refinement of ideas leading to a solution
- Final evaluation of solution set against original specification using field trials
- Consideration by client, user group, experts in relevant field.

(8 marks)

**Total 24 marks**