



# General Certificate of Education

## Design and Technology: Product Design (5551/6551)

*Unit 3 (3D Design) PD3D*

# Mark Scheme

*2005 examination - June series*

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.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

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# Design and Technology: Product Design

## 3D Design Unit 3 (PD3D)

### *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>	<i>Marks</i>
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
The candidate will express moderately complex ideas clearly and reasonably fluently, through well-linked sentences and paragraphs. Arguments will be generally relevant and well structured. There may be occasional errors of grammar, punctuation and spelling.	3
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
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

**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.

**Question 1**

(a) Suitable definition of ergonomics:

e.g. Ergonomics concerns the study of the interaction between the human body and consumer products, systems or environments. (2 marks)

(b) Suitable definition of anthropometrics:

e.g. anthropometrics is concerned with using body measurements when designing products, systems and environments.  
“body measurements”= 2 marks (2 marks)

(c) List of ergonomic and anthropometric features of a PC workstation.  
May include:

- Adjustable seat height to take into account different body sizes
- Adjustable back rest to take into account preferred sitting position
- Cushioned seat
- Sculpted seat to ‘fit’ body
- Use of breathable fabrics on seating
- Wheels on seat for manoeuvrability around the station
- Foot rest under workstation to lift feet off floor
- Adjustable monitor to avoid neck strain
- Left/right hand mouse
- Wrist pads for mouse/keyboard
- Document holder to avoid neck strain
- Adjustable font size/colour on screen
- Ease of assembly of workstation from flat-pack
- Blinds on window to reduce screen glare
- Temperature +25°C
- Diffused office lighting to reduce screen glare
- Etc.

1 – 2 marks per relevant point

Award marks as follows:

- Little relevant knowledge shown, candidate typically makes superficial reference to some obvious points, e.g. adjustable seat, without considering a wider range of ergonomic and anthropometric features. (1 – 3 marks)

- Candidate shows some knowledge of the ergonomic and anthropometric requirements of a work station listing more than the obvious points. There maybe some irrelevant points made. May explain one or two points in detail. (4 – 7 marks)
- Candidate is clearly knowledgeable about the ergonomic and anthropometric requirements of a workstation and lists a range of appropriate points with explanation where needed. (8 – 10 marks) (10 marks)

(d) Explanation of how designers might assess the ergonomics of a PC workstation. (Candidates can refer to testing anthropometrics).  
May include:

- use of scale drawings and ergonome template
- use of CAD & Virtual testing
- full size mock-up & live testing with consumer focus group
- small scale trials with a prototype workstation

1 – 2 marks per relevant point

Award marks as follows:

- little understanding shown, candidate may have misunderstood the question, and while there will be some creditworthy points, most of the response will be confused and disjointed. (1 – 2 marks)
- Candidate understands the concept of testing prototypes or models for ergonomic qualities and will give some methods of doing this but will lack some clarity of understanding. May explain one or two methods in detail. (3 – 4 marks)
- Candidates shows sound understanding of the ways in which the ergonomic qualities of the design are assessed. Clear examples will be given to illustrate points. Information will be coherent and logical. (5 – 6 marks) (6 marks )

**Total 20 marks**

**Question 2**

(a) Range of initial ideas

Marks will be awarded as follows:

- Limited range of ideas which are very similar. Little annotation to indicate potential for development. Such ideas will generally be worthy of 1 mark per drawing. (1 – 5 marks)
- Range of appropriate ideas. May be small in number have some variety, having alternative design features. Such ideas will generally be worthy of **up to** 3 marks per drawing. (6 – 10 marks)
- Wide range of good quality design ideas. Designs will be varied and show a number of different features. Such ideas will generally be worthy of 3 marks per drawing. However, candidates with fewer ideas but that are of very good quality should be able to access marks in this band. (11 – 15 marks) (15 marks)

- (b) (i) Quality of communication
- Drawing mainly 2D, untidy, limited annotation with little thought (1 – 3 marks)
  - Drawing combination of 2D and 3D. Annotation showing some thought to the design requirements. Use of colour, texture and tone to enhance the drawings (4 – 7 marks)
  - Drawings combination of 2D and 3D. Good use of colour and texture to enhance drawings. Thorough annotation showing consideration to the design criteria (points form the spec, details of materials and components etc) (8 – 10 marks) (10 marks)

(ii) Originality / innovation of product

Marks awarded as follows:

- Uninspiring initial ideas and final design which are stereotypical. Designs will probably be inappropriate for intended end-use however, there will be an attempt to incorporate a design feature, an interesting use of a material of a material or component. (1 – 3 marks)
- Designs may be varied and the final design lacks flair but will probably be appropriate to end use. There will be **one to two** innovative features, innovative use of materials or components. (4 – 6 marks)
- Candidate has attempted to produce imaginative designs but products lack interest and designs are not wholly relevant to the theme. There will be **up to three** examples of innovative features, innovative use of materials or components. (7 – 9 marks)
- Sound ideas and final design clearly appropriate to theme with **up to four** examples of innovative features, innovative use of materials or components. (10 – 12 marks)



- Highly original ideas which exploit the use of the theme. There will be **more than four** occasions where the candidate has shown innovative design features, innovative use of materials or components. (13 – 15 marks) (15 marks)

**Note:** some candidates may only produce a small number of designs but they may be extremely original and innovative. If this is the case, award marks in the higher mark range for innovative and originality.

(iii) Appropriateness of materials and components:

Marks awarded as follows:

- Limited range of materials across design with little clear detail. E.g. 'steel'. Maybe repeated throughout the drawings. Some maybe inappropriate. (1 – 3 marks)
- Range of appropriate materials and components. Some maybe repeated. (At least 3 different specific materials described, and / or components sketched to gain top of this range). (4 – 7 marks)
- Wide range (at least four) with some components sketched or developed into the final design. Materials and components are entirely appropriate to the theme. (8 – 10 marks) (10 marks)

(iv) Methods of construction

Marks will be awarded as follows:

- Limited information about how the product will be constructed. Probably **one or two** stated in simple labels. (1 – 3 marks)
- Variety (**two or three**) of appropriate construction methods stated and / or at least one construction / manufacturing method sketched and explained – awarding the higher mark for level of detail. (4 – 7 marks)
- Clear information about appropriate construction methods with use of exploded drawings to show assembly of **two** areas or drawings of industrial manufacture with accompanying notes explaining its use in the product. (8 – 10 marks) (10 marks)

(v) Dimensions and dimensioning:

Marks will be awarded as follows:

3 marks for overall length, width and depth  
Up to 6 marks if sub components dimensioned appropriately (6 marks)

(vi) Suitability of finish

Marks will be awarded for:

- Specific finish named e.g. anodising (1 – 2 marks)
- Specific finish named with basic description of its application, justification for its use or justification for no finish. (3 – 4 marks)
- Specific finish named with a full description of application or justification for its use or justification for no finish. (5 marks) (5 marks)

(vii) Specification criteria met

Marks will be awarded for:

- One or two points of the specification addressed (1 – 2 marks)
  - Most of the specification points addressed (3 – 4 marks)
  - All specification points addressed (5 marks) (5 marks)
- Total 76 marks**

### **Marking Annotation Sheet**

The following letters are to be inserted onto the A3 sheets where credit is given for answers:

- I** = Originality and Innovation
- M** = Materials and Components
- C** = Construction
- F** = Finish