



ASSESSMENT and  
QUALIFICATIONS  
ALLIANCE

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# Mark scheme January 2004

## GCE

### Design and Technology

### Product Design: Unit PD1D

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## 3D Design Unit 1

### *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-lined 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

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 specific material named for the dining chair.  
Accept tubular steel etc.  
1 mark for steel, beech etc  
2 marks for stainless steel, beech veneers (1–2 marks)
- (b) Suitable description giving the main properties of the material
- Breakdown.
- Basic description, few relevant properties given. (1–2 marks)
- Better description with a number of properties given. (3–4 marks)
- Full description linking material properties to product function, design or manufacture. (5 marks)
- (c) Description using notes and diagrams showing suitable manufacture of chair.
- Breakdown.
- Basic diagram with some manufacturing details given. May not be entirely appropriate method. (1–3 marks)
- Better diagram with most of the main manufacturing details given. (4–6 marks)
- Clear diagram(s) with comprehensive description of manufacturing. (7–9 marks)
- Note - If only one part of the chair is described (max 5 marks)**
- (d) Any suitable polymer e.g. Polypropylene, High Density Polyethylene, rigid PVC, PVCu, uPVC, ABS etc. (**NOT** HIPS, PVC or acrylic.) (2 marks)  
If ‘thermoplastic’ given (1 mark)
- (e) Suitable description giving the main properties of the material.
- Breakdown.
- Basic description, few relevant properties given. (1–2 marks)
- Better description with a number of properties given. (3–4 marks)
- Full description linking material properties to product function, design or manufacture. (5 marks)

- (f) Description using notes and diagrams showing the suitable manufacture of the chair using a polymer. E.g. Injection moulded.  
1 mark for correct name of process
- Breakdown  
Basic diagram with some manufacturing details given. May not be entirely appropriate method but could be used. (1–3 marks)
- Better diagram with most of the main manufacturing details given. (4–6 marks)
- Clear diagram(s) with comprehensive description of manufacturing. (7–9 marks)
- (g) Description of how the stool in Figure 3 could be made as a prototype.
- Breakdown  
2 marks for specific material.  
Basic description e.g. “Glue some MDF together and turn it to make the legs and the top.” (1–3 marks)
- Better description e.g. “Laminate a block of MDF together using PVA. Turn this on a lathe to make the legs. Smooth with glass paper and paint.” (4–6 marks)
- Detailed description e.g. “Laminate 4 blocks of MDF together using 15mm MDF and PVA, repeat for the top. Allow this to set. Turn each to the desired diameter on a centre lathe or wood lathe. Turn the end of the legs to a smaller diameter and drill the underside of the seat....” (7–8 marks)

**Total 40 marks**

Question 2

- (a) Any specific material suitable for the lamp base.  
**(Not materials for mass production).** (2 marks)
- (b) Suitable description giving the main properties of the material.
- Breakdown.
- Basic description, few relevant properties given. (1–2 marks)
- Better description with a number of properties given. (3–4 marks)
- Full description linking material properties to product function, design or manufacture. (5 marks)
- (c) Description using notes and diagrams showing making details of lamp base with chosen material.
- Breakdown.
- Basic diagram with some making details given. May not be entirely appropriate method. (1–3 marks)
- Better diagram with most of the main making details given. (4–6 marks)
- Clear diagram(s) with comprehensive description of making. (7–9 marks)
- (d) (i) Any suitable specific material for part B (2 marks)
- (ii) Any suitable specific material for part C (2 marks)
- (e) Description using notes and diagrams showing suitable assembly of parts B & C.
- Breakdown.
- Basic diagram with some assembly details given. May not be entirely appropriate method. (1–3 marks)
- Better diagram with most of the main assembly details given. Assembly method suitable. (4–6 marks)
- Clear diagram(s) with comprehensive description of an appropriate assembly method. (7–8 marks).

**Total 28 marks**

Question 3

**Four** reasons why each material is suitable for the product shown.

- (a) PP (Polypropylene) tooth brush handle.
- Low cost when made in volume.
  - High stiffness and good strength compared to polythene.
  - Relatively high toughness polymer.
  - Self coloured.
  - Not affected by water.
  - Etc.
- (b) PET drinks bottles.
- Flexible.
  - Transparent.
  - Impact resistance.
  - Non toxic
  - Non permeable
  - Thermoplastic suitable for blow moulding.
  - Recyclable.
  - Widely available & therefore inexpensive.
  - Etc.
- (c) Aluminium drinks cans.
- Widely available and inexpensive.
  - Recyclable.
  - Malleable and suitable for press forming etc..
  - Doesn't corrode.
  - Crushable to aid disposal/recycling.
  - Etc.
- (d) Copper water pipes.
- Non toxic.
  - Malleable to allow pipe bending.
  - Easily joined with solder or compression fittings.
  - Widely available in a variety of sizes.
  - Tarnishes but does not corrode.
  - Etc.

- (e) MDF flat-pack furniture.
- Widely available and inexpensive so furniture is cheaper to manufacture.
  - Available in long wide boards ideal for making furniture.
  - Can be covered in a variety of laminates/veneers to suit tastes.
  - Stable, does not warp or twist.
  - Makes use of by-products from timber industry and in constant supply.
  - Can be drilled, routered etc. for KD fittings.
  - Etc.
- (f) Beech kitchen utensils.
- Non toxic.
  - Hard – resists scratching and abrasion from use or cleaning.
  - Close grain, ideal for turning. Gives a good finish.
  - Durable, withstands occasional immersion in water. Good wear properties.
  - Relatively inexpensive.
  - Etc.
- (g) Glass reinforced plastic (GRP) Boats.
- Available in a variety of sizes to suit.
  - Laminating allows complex forms to be shaped.
  - Tough.
  - Waterproof.
  - Self coloured.
  - Designs easily modified to suit customer needs.
  - Etc.

Breakdown.

1 mark per relevant point (max. 4 marks per material).

(7 x 4 marks)

If generic list is given e.g. malleable, ductile, hard etc – max 2 marks

**Total 28 marks**



Question 4

- (a) Suitable specific material given and description of ductility e.g.

Ductility is the ability of a material to be drawn out to a reduced cross sectional area. E.g. copper bar can be heated, drawn, beaten, rolled and formed into a narrower section.

Breakdown.

Specific material given – 2 marks

Suitable material given. Explanation is basic and may only be partially correct. (1–3 marks)

Suitable material given. Explanation is correct. (4–5 marks)

Suitable material given with full and correct explanation of ductility. (6–8 marks)

- (b) Description using notes and diagrams to show how ‘ball ends’ can be joined with an explanation of the suitability.

Possible methods and explanations may include:

- Soldering e.g. silver solder – solders available with different melting points to allow for sequential joining operations. (Heating up one part won’t melt the previous joint).
- Mechanical fixings with an adhesive. E.g. Holder fixed into bracelet with a small pin and an adhesive. Ball details could be tapped and screwed onto the ends of the bracelet. This could be done for speed of assembly. Little cleaning required.
- Interference fit of the ball details to the ends of the bracelet. For speed and cleanliness.
- Etc.

Breakdown.

Basic diagram with some assembly details given. May not be entirely appropriate method. Little or no justification for use. (1–4 marks)

Better diagram with most of the main assembly details given. Assembly method suitable. Simple justification for use. (5–8 marks)

Clear diagram(s) with comprehensive description of an appropriate assembly method and full justification for its use. (9–12 marks)

- (c) (i) Reasons for suitability of polystyrene include:
- Lightweight–reduces fuel consumption in transport.
  - Can be moulded to shape of product.
  - Soft–won't scratch or damage bracelet.
  - Impact absorption properties. Protects contents.
  - Inexpensive, widely available material.
  - Can be recycled.

Breakdown.

1–2 marks per relevant reason given.

(4 marks)

- (ii) Alternative packaging material given with reasons for its suitability.

Breakdown.

Specific material 1–2 marks

Reasons for suitability 1–2 marks

(4 marks)

**Total 28 marks**

<b>Question total</b>	<b>96 marks</b>
<b>Quality of written communication</b>	<b>4 marks</b>
<b>Paper total</b>	<b>100 marks</b>