



ASSESSMENT and
QUALIFICATIONS
ALLIANCE

Mark scheme January 2003

GCE

**Design and Technology:
Product Design (3D)**

Unit PD1D

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Unit 1: Materials and Components (3D Design)

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 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 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 |

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.

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.
(low mark range)

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.
(mid mark range)

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.
(high mark range)

Question 1

- (a) (i) Acrylic cement – e.g. Tensol, accept liquid cement and other adhesives if they would work
 (ii) Contact Adhesive – e.g. Evostick
 (iii) PVA or synthetic resin – e.g. Cascamite
 (iv) Epoxy resin – e.g. Araldite
- 1 mark for correct adhesive
 - Up to 2 marks for suitable reasons.

E.g. Acrylic Cement melts the two surfaces together. Fast acting.

Economical as only small amount needed.

E.g. Contact adhesive spread on both surfaces goes tacky within a few minutes, adhering to the surface. Gives permanent bond between two dissimilar materials when joined together.

E.g. PVA – low cost, allows re-positioning of joint, dries clear, no fumes etc.

E.g. Epoxy resin two part thermosetting adhesive. Ideal for joining non-absorbent surfaces of dissimilar materials.

(4 × 3 marks)

- (b) Suitable drawings and description of appropriate fixings.
 E.g. Arched spring lock. Clips and fasteners. Self tapping screws, wood screws, machine screws, simple nut and bolt, grub screws. Corner ‘modesty’ blocks, Cam type KD fittings etc.

For each example:

If no diagram 1 mark for product. 1 mark for simple description

- Basic description with several points omitted.
 Diagram unclear or missing. (1 – 2 marks)
- Better description 1 or 2 points missing. Good diagram. (3 – 4 marks)
- Full description with text book diagram correctly labelled. (5 – 6 marks) (2 × 6 marks)

- (c) (i) Suitable drawings and descriptions of products using components. E.g.
 Kitchen cupboard using handles, plinths, hinges, mouldings
 Fireplace using MDF mouldings
 Power tools/appliances using standard switches
 Cars using standard light fittings etc.
 Accept KD fittings as a component.

For each example:

If no diagram 1 mark for product. 1 mark for simple description

- Basic description with several points omitted.
 Diagram unclear or missing. (1 – 2 marks)
- Better description 1 or 2 points missing.
 Good diagram. (3 – 4 marks)
- Full description with text book diagram correctly labelled. (5 – 6 marks) (2 × 6 marks)

- (ii) Benefits may include:

- Reduces assembly time
- Reduces manufacturing overheads as components made outside
- Parts can be changed/replaced
- Etc

(4 marks)

Total 40 marks

Question 2

(a) Application given for each:

(4 × 1 mark)

- (i) Foamboard – 3D models, mounting for presentation drawings, graphic products
- (ii) Corrugated cardboard – packaging/protective layer
- (iii) Expanded polystyrene – packaging, cups, food trays, insulation
- (iv) High impact polystyrene sheet – vacuum forming, bubble packs

(b) Reasons given for suitability (upto 2 marks/suitable reason max 6)

- (i) Foamboard – 3D models, mounting for presentation drawings, graphic products
 - lightweight
 - inexpensive
 - variety of thickness available
 - can be painted, drilled, etc
- (ii) Corrugated cardboard – packaging/protective layer:
 - inexpensive
 - lightweight
 - corrugated nature gives strength to weight
 - recyclable
- (iii) Expanded polystyrene – packaging:
 - light weight
 - can be moulded to ‘fit’ product
 - impact absorption
 - inexpensive
 - recyclability
- (iv) Rigid polystyrene (HIP) – vacuum forming, bubble packs:
 - range of colours and transparent
 - moulded easily
 - inexpensive
 - easily joined etc
 - impact resistance

(4 × 6 marks)

Total 28 marks

Question 3

- (a) Natural cell structure absorbs water. Damp conditions attract fungal and insect attack. Also deterioration due to warping and splitting with changes in moisture content.
- Basic explanation, few relevant points made. E.g. “water makes it rot”.
(1 – 2 marks)
 - Better description. Some details of warping, cupping, splitting **or** fungal/insect attack etc.
(3 – 4 marks)
 - Full description with reference to fungal/insect attack **and** movement of the timber due to changes in moisture content.
(5 – 6 marks) (6 marks)
- (b) Pressure treating e.g. tannelling
Accept polyurethane varnish, yacht varnish, water based preservative, outdoor/exterior, varnish or paint
Painted with preservatives e.g. Creosote
(accept waterproof wood stain e.g. Ronseal)
Method described.
Do not accept simply “varnish” or “paint”
- Method named. Basic description several points missing
(1 – 3 marks)
 - Method named. Number of correct points in description
(4 – 6 marks)
 - Method named. Detailed description of method.
(7 – 8 marks) (8 marks)
- (c) Polyurethane varnish/stain, waxes etc,
Accept: wax, teak oil, linseed oil, danish oil, sanding sealer
Method named and described
Allocate marks as above in (b). (8 marks)
- (d) Seasoning ensures removal of excess water in timber by controlled drying.
Required to:
- Kill insects (when kiln dried)
 - Make the timber more immune to rot and decay
 - Make the timber less corrosive to metals
 - Increase the overall strength and dimensional stability.
- Upto 2 marks/correct point
Credit references to seasoning process. (6 marks)

Total 28 marks

Question 4

- (a) (i) Stainless steel – sinks
- Doesn't corrode
 - Can be press formed
 - Hard, scratch resistant. Hygienic
 - Good finish, aesthetically pleasing
 - Resistant to chemicals – cleaning
- (ii) Aluminium – Kitchen foil
- Lightweight
 - Malleable – bends easily to wrap food
 - Doesn't corrode – taint food
 - Reflective – protects food from burning
- (iii) Copper – Pipes, water tanks etc
- Doesn't corrode
 - Easily joined with solder etc
 - Malleable – important in pipe bending etc
 - Conductor
- (iv) High Speed Steel – Drill bits, cutting tools/tools
- Harder than mild steel and non ferrous metals
 - Can be sharpened by grinding
 - Can be heat treated

Allocation of marks:**Applications (4 × 1 mark)****Reasoning (4 × 4 marks)**

- (b) Description of an alternative material and its suitability to one of the applications referred to in (a).

Specific material given – 2 marks plus

- Basic description with few points linked to application (1 – 2 marks)
- Better description with most points linked to application (3 – 4 marks)
- Full description with all points linked to commercial application (5 – 6 marks) (8 marks)

Total 28 marks

Questions total 96
Quality of written communication 4
Paper total 100