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GCE 2004
June Series

ASSESSMENT and QUALIFICATIONS ALLIANCE

Mark Scheme

Design and Technology: Product Design
(Subject Code PD1D)

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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Design and Technology: Product Design

3D Design Unit 3 (PD1D)

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.

Performance Criteria	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.

(low mark range)
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.
(mid 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.
(high 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.

In questions asking candidates to link properties to the product they must explain why the properties are useful in the product.

Question 1

(a) (i) Any suitable specific material for the plastic storage unit. (2 marks)

General reference.
GRP, PVC, thermoplastic, polythene (1 mark)

Specific material.
PET, Polyprop, Rigid PVC, PVCU, ABS, HDPE, etc. (2 marks)

If list of **correct** materials award (1 mark)

(ii) Suitable explanation 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)

If general list maximum 3 marks.

(iii) Description using notes and diagrams showing suitable manufacture of plastic storage unit.

Accept Injection moulding for drawers/shelves.
Extrusion blow moulding or rotational moulding for legs/frame.

Breakdown

Named correct process (1 mark)

Basic diagram with some manufacturing details given. May not be entirely appropriate method. (1 – 4 marks)

Better diagram with most of the main manufacturing details given. (5 – 8 marks)

Clear diagram(s) with comprehensive description of manufacturing. (9 – 10 marks)

(b) Notes and diagrams to show how **one** feature of the kitchen utility trolley could have been manufactured ensuring accuracy and repeatability.

E.g. CNC router/machining/CNC laser.
Spacer to give equal spacing of wooden slats.
Dowel jig for drilling of holes.
Templates for cutting comb joints or drawer handle detail.
Etc.

Breakdown.

Basic notes and diagram incomplete or unclear. (1 – 3 marks)
(No reference to repeatability)

Better notes and diagram, some details missing. (4 – 6 marks)
e.g. joining methods / jig ert

Good notes with clear diagram, no details missing. (7 – 9 marks)

For maximum mark must make reference to accuracy / repeatability. Maximum 4 if no reference.

(c) (i) Description using notes and diagrams of how **two** components could be used in the manufacture of the computer desk.

E.g. Drawer runner for keyboard shelf.
Castors/feet.
Plastic end caps for tubular steel.
Pre manufactured Conti-board made to size and edged.
Etc. Chipboard screw
KD fittings
Nuts & bolts
Screws
Metal frame.

Breakdown.

Named components (1 mark)

Basic notes and diagram incomplete or unclear (1 – 2 marks)

Better notes and diagram, some details missing. (3 – 4 marks)

Good notes with clear diagram, no details missing. (5 marks)

(2 x 5 marks)

(ii) Two benefits for the computer desk being flat-pack.
E.g. Easier for consumer to transport home.
Manufacturer saves assembly costs.
Easier for manufacturer to store/transport.
Manufacturing costs are reduced as less skilled labour required.
Etc. (2 x 2 marks)

Statement and explanation required for 2 marks.

Total 40 marks

Question 2

(a) Specific product named. Any suitable specific material **(from composites or metals)** given with a description of why the material is suitable for the mass-produced product.

Product named 0 marks Specific material only 2 marks

Breakdown.

Non-specific product e.g. "a car". 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 – 6 marks)

Max. 3 marks if product not given.

Acceptable composites: GRP, Plywood, MDF, chipboard, concrete, blockboard, CFRP, Tufnol,

(b) Description using notes and diagrams showing suitable manufacture of chosen product.

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 – 10 marks)

If completely inappropriate manufacturing methods – 0 marks.

(c) Two reasons for suitability of method of manufacture to chosen product.

E.g. Manufacturing method is suitable for volume of production e.g. press forming metals is fast and large volumes can be manufactured quickly.

Manufacturing method is suitable for material e.g. GRP is specifically designed for laminating/ lay-up techniques.

References to design features/standard components e.g. handles can be die cast from alloys to ensure repeatability.
Etc.

(2 x 3 marks)

(d) Two safety measures to protect employees.
E.g. Personal protective clothing (Max. 2 marks for lists of goggles, masks, overalls, boots, etc.).
Machines guarded.
Machines/processes extracted.
Health and safety training
Etc. (2 x 3 marks)

Statement and explanation for 3 marks OR extensive list.

Total 28 marks

Question 3

(a) Suitable explanation of the term thermoset plastics.

E.g. Thermoset plastics are plastics which once set, can not be re-formed or re-shaped with further application of heat. (2 marks)

(b) Any specific thermoset plastic with a suitable product e.g.
Urea Formaldehyde – Electric light switches.
Melamine Formaldehyde – Work surface laminates, Plastic plates etc.

Etc.

If material wrong but product ok 2 marks

(2 marks for product)
(2 marks for specific material)

(4 marks)

(c) Suitable explanation 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)

If general list - maximum 3 marks

(d) Description using notes and diagrams showing suitable manufacture of chosen product. E.g. compression moulding

NB. Only accept injection moulding if candidate acknowledges that it is unusual to injection mould with thermosets if candidate does not acknowledge this maximum 3 marks. Credit casting with resin and laminating with GRP.

Breakdown.

Basic diagram with some manufacturing details given. May not be an 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 – 10 marks)

(e) Any suitable specific thermoplastic e.g. HIP, PET, LDPE, Acetate, expanded polystyrene. (2 marks)
Generic e.g. polystryrene, polythene. etc. (1 mark)

Bubble wrap (0 marks)

(f) Suitable explanation 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)
Maximum 3 marks for generic list.	Total 28 marks

Question 4

(a) Any suitable specific material e.g. Styrofoam, Balsa wood, laminated MDF, ABS, Acrylic, HIPS etc. (2 marks)

If list of correct materials award 1 mark.

(b) Suitable explanation 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 manufacture of the model.	(5 marks)

If generic list max 3 marks

(c) Breakdown.

If mass manufacturing method	(0 marks)
Basic diagram with some manufacturing details given.	(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)

(d) **Detailed** description of how the model would be finished.
E.g.

- Filling imperfections or covering entire surface with car body filler.
- Sanding with abrasive paper.
- Spraying with filler/primer.
- Light sanding.
- Spray on base coats with cellulose based car sprays.
- Subsequent re-coats and top coat of clear laquer.
- Application of dry transfer lettering/use of CNC graphics.
- Etc..

Breakdown.

Basic finishing details given, generic terms used. (1 – 2 marks)

Better description with most of the main finishing details given. Specific finishes named. (3 – 4 marks)

Comprehensive description of the finishing process. (5 – 6 marks)

(e) Specific material named with suitable explanation giving the main properties of the material.

Accept ABS, MF, UF, Polycarbonate, HIPS, Ridid polystyrene, stainless steel, anodised aluminium
Not acrylic, polyprop or HDPE.

Breakdown.

Specific material named, few relevant properties given. (1 – 2 marks)

Specific material named with better description of properties given. (3 – 4 marks)

Specific material named with full description linking material properties to manufacture of the product. (5 – 6 marks)

If generic list award 3 marks **Total 28 marks**

Question total **96 marks**
Quality of written communication **4 marks**
Paper Total **100 marks**