

Mark Scheme (Results)

June 2011

GCE Design and Technology:
Product Design (6GR02).

Paper 01: Design and Technology
in Practice (Graphic Products).

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Publications Code US027697

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- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Mark schemes will indicate within the table where, and which strands of QWC, are being assessed. The strands are as follows:
 - i) ensure that text is legible and that spelling, punctuation and grammar are accurate so that means is clear
 - ii) Select and use a form and style of writing appropriate to purpose and to complex subject matter
 - iii) Organise information clearly and coherently, using specialist vocabulary when appropriate













Question Number	Answer	Mark
1(a)	<p>Justified answer:</p> <ul style="list-style-type: none"> • A scale model (1) allows designer to see proportion of the building/features (1) • Allows the designer/client to realise the 2D design (1) into 3D (1) • Allows designers to solve problems at the design stage (1) rather than at the more expensive building stage (1) • Allows testing (1) to ensure environmental problems are solved (1) • Allows materials/colours (1) to be experimented with prior to final build to ensure it 'fits' environment (1) • allows 3D model to be transported (1) so clients can have a first hand input (1) <p style="text-align: right;">(2 x 1)</p>	(2)

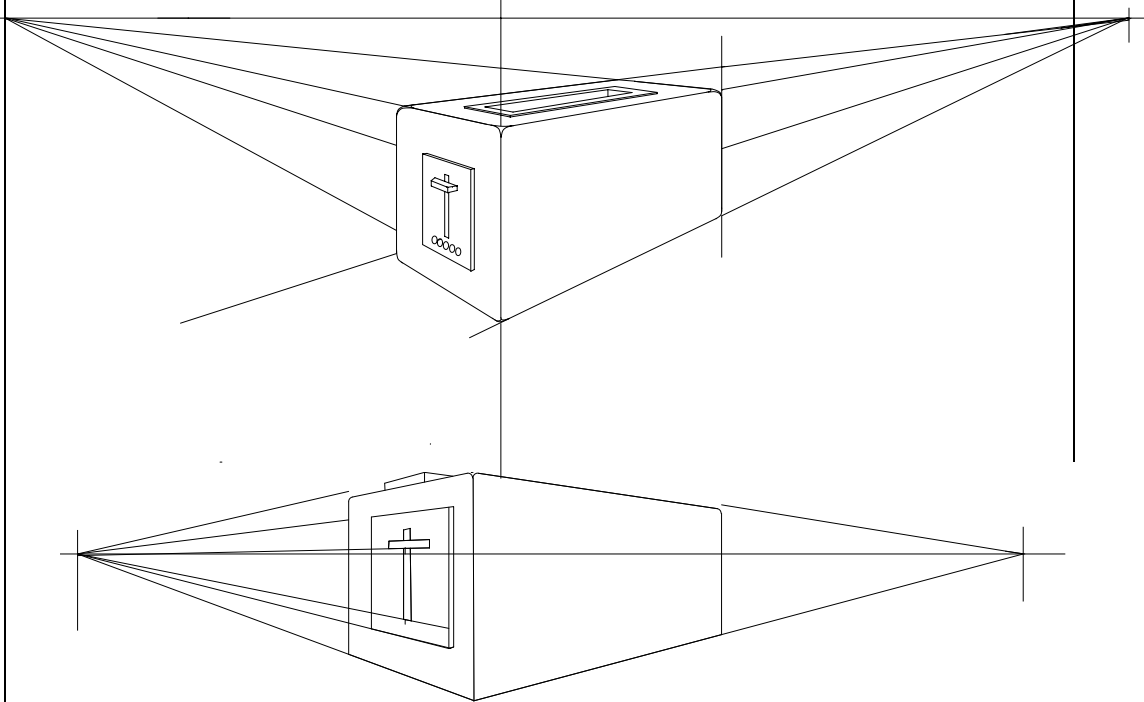
Question Number	Answer	Mark
1(b) (i)	<p>Any one from the following:</p> <ul style="list-style-type: none"> • No grain, so no tendency to split (1) • Range of thicknesses / large sheets (1) • Less expensive than 'natural' timber (1) • flat/rigid surface (1) • stable/dense/supportive surface for model (1) • surface takes paint/other modeling features (1) • smooth surface (1) <p><i>[Do not except cheap or reference to cost]</i></p> <p style="text-align: right;">(1 x 1)</p>	(1)

Question Number	Answer	Mark
1(b) (ii)	<p>Mechanical: any one from the following:</p> <ul style="list-style-type: none"> • Lightweight (1) • Straight grain (1) • Fine grain/texture/short fibres (1) <p>Functional: any one from the following:</p> <ul style="list-style-type: none"> • Easy to cut and work (1) • Glues well (1) • Good finish can be achieved due to fine grain (1) • Takes paint easily (1) <p><i>The responses must be written under the appropriate heading, i.e. mechanical or functional.</i> <i>Must have one from mechanical and one from functional for max marks.</i></p> <p style="text-align: right;">(1 x1)(1 x1)</p>	(2)

Question Number	Answer	Mark
1 (c)	<p>Advantage: any one from the following:</p> <ul style="list-style-type: none"> • Inexpensive (1) • Strong joint (1) • Easy to use (no mixing- straight from tin) (1) • Can be reversed/soaking in water (1) • Can be used for range of woods/cards used in modeling (1) • Odourless/non-toxic (1) <p>Disadvantage: any one from the following:</p> <ul style="list-style-type: none"> • Work needs to be clamped (1) • Takes time to dry/not instant (1) • does not stick "non-like" materials (1) • may come unstuck when in contact with water (1) • stains/marks wood (1) <p><i>advantage and disadvantage must be different for max marks</i> (1 x1)(1 x1)</p>	(2)

Question	Answer	Mark		
1 (d)	<p>The 2 control measures MUST be directly linked to the risk.</p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Risk: any one from the following:</p> <ul style="list-style-type: none"> • Damage to eyes from flying material/dust (1) • Cuts from material/blade (1) • Inhalation of dust (1) • Amputation (1) • Entanglement (1) </td> <td style="width: 50%; vertical-align: top;"> <p>Control measure: any two from the following:</p> <ul style="list-style-type: none"> • Use PPE/tie hair back/mask etc. (1) • Use machine guards/height restrainer (1) • Ensure extraction/use scroll saw dust blower (1) • Have proper training for use of machine (1) • keep fingers away from blade (1) • have proper supervision (1) • other students behind yellow line/1m away (1) • controlled cutting (1) • one person to use the machine (1) • clear work area (1) </td> </tr> </table>	<p>Risk: any one from the following:</p> <ul style="list-style-type: none"> • Damage to eyes from flying material/dust (1) • Cuts from material/blade (1) • Inhalation of dust (1) • Amputation (1) • Entanglement (1) 	<p>Control measure: any two from the following:</p> <ul style="list-style-type: none"> • Use PPE/tie hair back/mask etc. (1) • Use machine guards/height restrainer (1) • Ensure extraction/use scroll saw dust blower (1) • Have proper training for use of machine (1) • keep fingers away from blade (1) • have proper supervision (1) • other students behind yellow line/1m away (1) • controlled cutting (1) • one person to use the machine (1) • clear work area (1) 	(3)
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1 (e)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%; text-align: left;">sign</th> <th style="width: 50%; text-align: left;">meaning</th> </tr> </thead> <tbody> <tr> <td>  </td> <td> <ul style="list-style-type: none"> • First Aid (1) <i>Accept:</i> <ul style="list-style-type: none"> • First Aid box (1) • First Aid station (1) </td> </tr> <tr> <td>  </td> <td> <ul style="list-style-type: none"> • Approved goggles must be worn (1) <i>Accept:</i> <ul style="list-style-type: none"> • wear goggles (1) • safety goggles (1) • safety glasses (1) • eye protection must be worn (1) • wear eye protection (1) • eye protection (1) </td> </tr> <tr> <td>  </td> <td> <ul style="list-style-type: none"> • Fire extinguisher (1) </td> </tr> <tr> <td>  </td> <td> <ul style="list-style-type: none"> • Emergency stop (1) <i>Accept:</i> <ul style="list-style-type: none"> • emergency stop button (1) • stop button (1) • emergency power switch (1) </td> </tr> </tbody> </table>	sign	meaning		<ul style="list-style-type: none"> • First Aid (1) <i>Accept:</i> <ul style="list-style-type: none"> • First Aid box (1) • First Aid station (1) 		<ul style="list-style-type: none"> • Approved goggles must be worn (1) <i>Accept:</i> <ul style="list-style-type: none"> • wear goggles (1) • safety goggles (1) • safety glasses (1) • eye protection must be worn (1) • wear eye protection (1) • eye protection (1) 		<ul style="list-style-type: none"> • Fire extinguisher (1) 		<ul style="list-style-type: none"> • Emergency stop (1) <i>Accept:</i> <ul style="list-style-type: none"> • emergency stop button (1) • stop button (1) • emergency power switch (1) 	(4)
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Total for question		14 marks										

Question Number	Answer	Mark
2(a)	<p>Accept free hand sketch.</p>  <p>Marks for:</p> <ul style="list-style-type: none"> • Perspective construction lines (1) • accurate representation of toaster outline (1) • Correct proportion/reasonable proportions (1) • Radii corners (1) • Top toast slot detail (1) • End slider details (1) <p style="text-align: right;">• (5x1)</p> <p><i>If no construction lines max 3 marks</i> <i>If correct construction lines BUT incorrect sketch 0 marks</i></p> <p><i>Do not accept one point perspective or isometric or axonometric or planometric or oblique.</i></p>	(5)

Question Number	Answer	Mark
2(d)	<p>Any three from the following:</p> <ul style="list-style-type: none"> • 3D/scale models are easier to check for errors(1) • Models can be used for marketing shots (1) • Allows designer to evaluate design alterations (1) • A physical model is easier to "sell" to customers, manufacturers, management (1) • Direct conversion from CAD allows quicker/accurate realization of the design(1) • RPT production faster than traditional prototype manufacture(1) • produces complex intricate shapes(1) • used to get "feel"/ergonomics of final product(1) • avoids high cost of errors in final production (1) <p><i>No marks for describing the RPT process</i> <i>No marks for "fast/quick" this needs to be justified</i></p> <p style="text-align: right;">(3x1)</p>	(3)

Question Number	Answer	Mark
2(e)	<p>Any two from the following:</p> <ul style="list-style-type: none"> • Measure/scan using probe/laser probe/densitometer (1) • Checks for colour density/smudges/colour bars/hickes (1) • Checks for alignment/registration marks (1) • Provides immediate feedback (1) • Determines if coordinates of specific points are within tolerance (1) • Probe controlled in three axis (X-Y-Z) (1) <p><i>This question is concerned with inspection only.</i></p> <p style="text-align: right;">(2x1)</p>	(2)
Total for question		14 marks

Question Number	Answer	Mark
3(a)	<p>Any four from the following:</p> <p>The screw is forced forward under hydraulic high pressure and injects the liquid plastic into the mould (1)</p> <p>Sketch must show Archimedian screw (1) Then any three further points</p> <p><i>Max 3 marks if no Archimedian screw shown</i> <i>Max 3 marks for accurate sketch with no annotation</i></p> <p>(4x1)</p>	(4)

Question Number	Answer	Mark
3(b)	<ul style="list-style-type: none"> • Crystals absorb light/light energy in normal daylight (1) • energy is stored and released slowly in the form of light (1) <p>(2x1)</p>	(2)

Question Number	Answer	Mark
3(c)	<p>Any four from the following:</p> <ul style="list-style-type: none"> • Mould/highly polished mould (1) • Mould covered with release agent to ensure it can be released from GRP when finished (1) • First layer is gel coat, coloured polyester resin (1) • Polyester resin and catalyst/hardener is mixed to ensure resin 'sets' (1) • Chop strand mat/glass fibres or woven wordings used (1) • Layers of polyester resin and chopped strand mat/woven wrovings layered on mould (1) • air rolled out of polyester resin, CSM layers (1) • Can be hand rolled or use resin/CSM spray gun (1) • Edges need to be trimmed after lay up (1) • Mould is removed leaving shell structure (1) <p>(4x1)</p> <p>No marks are awarded for sketches</p>	(4)

Question Number	Answer	Mark
3(d)	<p><i>Either:</i> Testing to Destruction:</p> <ul style="list-style-type: none"> • Product is tested in controlled conditions (1) • Force is applied until the product breaks(1) • Information is gathered on how much protection is gained (1) • Information is gathered on how much force is needed/limits of force at point of destruction (1) • Information is gathered on how the product behaves/breaks upon breaking (1) <p><i>Or:</i> Non-Destructive testing:</p> <ul style="list-style-type: none"> • Product is tested in controlled conditions (1) • Force is applied until deformation occurs (1) • Information is gathered on materials and construction (1) • Information is gathered on how the product behaves/deforms/protects under pressure (1) <p><i>The responses must be written under the appropriate heading, i.e. testing to destruction or non-destructive testing.</i></p> <p style="text-align: right;">(2x1)</p> <p><i>Features of testing, NOT types of testing.</i></p>	(2)

Question Number	Answer	Mark
3(e)	<p>Any two from the following:</p> <ul style="list-style-type: none"> • Excellent impact resistance/absorb energy/protects the product (1) • Lightweight (1) • Easily formed for the crash helmet to fit (1) • Relatively inexpensive (1) <p style="text-align: right;">(2x1)</p>	(2)
	Total for question	14 marks

Question	Answer	Mark
4(a)	<p>Advantages: (max 2 marks)</p> <ul style="list-style-type: none"> Stiff card covers protect pages (1) Extremely durable/hardwearing (1) impression of professional quality/value for money impression(1) Sewn-in pages do not fall out (1) generally lasts longer than other bound book types (1) <p>Disadvantages: (max 1 marks)</p> <ul style="list-style-type: none"> Time consuming to produce (1) Expensive in materials compared to perfect/other binding (1) Expensive for machines compared to perfect/other binding (1) Books often heavier/bigger (1) <p><i>For max marks must have both advantages and disadvantages. (2x1)</i></p>	(3)

Question Number	Answer	Mark
4(b)	<p>Any two from the following:</p> <ul style="list-style-type: none"> Strong paper (made from rag pulp) (1) Clear paper grain direction which helps in fold and stitch process (1) Durable/doesn't rip easily (1) High quality surface finish/printing surface (1) Good quality paper(1) <p>(2x1)</p> <p><i>Do not accept cheap /easy to print on.</i></p>	(2)

Question Number	Answer	Mark
4(c)	<p>Any four from the following:</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Male-female Die Embossing</p> </div> <div style="text-align: center;"> <p>Embossing Stamp and Rubber Mat</p> </div> </div> <ul style="list-style-type: none"> Recognisable sketch (1) Raised surface/male die (1) Female die/stamp onto rubber surface (1) Force exerted (1) Valid statement on condition of paper eg damp (1) Valid statement on condition of dies eg warm (1) <p><i>Sketches must be shown, maximum 3 marks if not present.</i> (4x1)</p>	(4)

Question Number	Answer	Mark
4(d)	<p>Any three from the following:</p> <ul style="list-style-type: none"> • improve aesthetic appeal/enhances the cover (1) • Reflective metal used a gimmick on cover (1) • gives impression of 'luxury' (1) • adds perception of value (1) • can be used to highlight areas (1) • draws attention to the cover as marketing issue(1) • traditional use for hardback book titles (1) • dry process/so no fumes emitted (1) 	(3)

Question Number	Answer	Mark
4(e)	<p>Answers must be justified:</p> <ul style="list-style-type: none"> • Surface finish of recycled board is poor (often grey) (1) but case bound books are often covered so using better quality card is not necessary (1) • solid white board is expensive (1) so reducing cost of covers using recycled board gives better levels of profit (1) • As the covers are often decorated with leather/PVC/paper covering (1) there is little need in using virgin material that use natural resources (1) • more environmentally friendly to use recycled covers (1) so publishers seen as eco-friendly (1) • Possible to use thicker recycled card for similar cost of thin solid white card (1) so giving additional impression of quality (1) 	(2)
	Total for question	14 marks

Question Number	Answer	Mark
5(a)	<p>Any four from the following:</p> <ul style="list-style-type: none"> • Stainless steel is hardwearing/strong/durable/scratch resistant (1) • Resistant to corrosion/staining/doesn't rust (1) • Rigid/impact resistant and therefore means the mechanism within is not affected in any way (1) • High quality finish (1) • fashionable/stylish/modern (1) • Low maintenance/easy to clean (1) • Colour/finish 'fits' style of the watch i.e. tough, sporty (1) • Black/silver colour scheme is masculine (1) • Gives feeling of quality (1) • Heavy/weight gives feeling of value for money (1) • Not affected by magnets • surface scratches can effect overall visual appeal (1) <p style="text-align: right;">(4x1)</p> <p><i>Do not accept expensive.</i></p>	(4)

Question Number	Answer	Mark
5(b)	<p>Any five from the following:</p> <ul style="list-style-type: none"> • Converts electrical energy into light (1) • Power is applied across electrodes (1) • Organic phosphor sandwiched between the electrode conductors (1) • When electrical charge is applied phosphor crystals are charged (1) • Phosphor crystals emit radiation which is seen as light (1) • different organic compounds emit different colour light/green/yellow (1) • Extremely low current/very high voltage (1) • Low energy consumption (1) • Can be 'packaged' in variety of panels/wires/strips for different applications (1) <p style="text-align: right;">(5x1)</p>	(5)

Question Number	Answer	Mark
5(c)	<p>Any five from the following:</p> <p>Advantages</p> <p><u>Organization</u></p> <ul style="list-style-type: none"> • organizations receives accreditation/BSI logo for producing consistently high quality products (1) • organizations have a culture for quality (1) • international standard that strives to improve quality (1) <p><u>employers</u></p> <ul style="list-style-type: none"> • employers/whole organization effected from cradle to grave (1) • employers/organization returns better profits (1) • employers/whole organization improve their reputation (1) • employers/organizations improves its environmental impact (1) • employers have increased profits/operational results/market share (1) <p><u>employees</u></p> <ul style="list-style-type: none"> • employees have better working conditions/morale/health and safety (1) • employees have better job satisfaction (1) • employees have greater input/better training/are more valued (1) <p><u>customers</u></p> <ul style="list-style-type: none"> • customers receive products that are higher standard/reliable (1) • customer satisfaction with service/product improved as less breakages/better service (1) • customer reassured by quality of organization (1) <p>Disadvantages</p> <ul style="list-style-type: none"> • Needs rigorous analysis to achieve accreditation (1) • Time consuming for employers and employees(1) • Accreditation costs that can be transferred to product cost/customers (1) • Regular monitoring to keep up standards/re-accreditation (1) • Some employees resistant to change (1) 	(5)
	Total for question	14

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Welsh Assembly Government

