



General Certificate of Education

Design and Technology: Product Design (3-D Design) 2550

Post-Standardisation

PROD1

Mark Scheme

2012 examination - January 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.

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COMPONENT NUMBER: 2550

COMPONENT NAME: PROD1

STATUS: Post-Standardising

DATE: 23-01-2012

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. This candidate does not have a clear idea of what s/he is writing about.
(mid mark range)
The candidate has some knowledge but there will be less clarity of understanding. Some correct examples given to illustrate points made. This candidate knows what s/he is writing about but is confused in part.
(high mark range)
The candidate has a thorough understanding of the issues and has provided relevant examples to support the knowledge shown. This candidate knows what s/he is writing about and provides clear evidence of understanding.

JANUARY 2012 SERIES**COMPONENT NUMBER: PROD1****COMPONENT NAME: Materials, Components and Application****STATUS: Post-Standardising**

Question	Part	Sub Part	Marking Guidance	Mark	Comments
1	a		<p>Thermoset polymers form rigid cross links in the polymerisation process. They can't be reshaped by applying heat and are therefore difficult to recycle.</p> <p>Accept any reference to 'once set / formed it can't be reshaped by reheating'.</p>	2	
1	b		<p>Suitable products : Electrical Fittings. Accept decorative laminates, adhesives, foundry sand moulds, bonding resin in manufactured boards.</p> <p>E.g. UF is an excellent electrical insulator so there is no risk to the user from electric shock when using things like light switches. UF is heat resistant and will not be affected by heat from high wattage lightbulbs or from sparking due to short circuits/faulty equipment.</p> <p>Accept UF for spoons (if candidate is discussing disposable spoons don't give credit).</p>	3	<p>Breakdown</p> <p>1 mark for a suitable product</p> <p>2 marks for explanation linking relevant property(s) of UF to chosen product.</p> <p>If product it not suitable for UF award no marks.</p> <p>If a product given with a list: max 2 marks.</p>
2			<p>Suitable products: Curved/'bentwood' furniture, shop/interior fittings e.g. curved counter top, etc. As a former for moulding/laminating against. Used as a curved skin to cover a frame.</p> <p>E.g. Flexible MDF has cuts in one side to allow it to flex into curves as required to make 'bent wood furniture'. Flexible MDF is available in long, wide boards so larger areas can be covered quickly instead of gluing lots of pieces together.</p>	3	<p>Breakdown</p> <p>1 mark for a suitable product</p> <p>2 marks for explanation linking relevant property(s) of flexible MDF to chosen product.</p>

			<p>Must make reference to 'curved'.</p> <p>Accept – no grain problems can be veneered.</p>		<p>If product it not suitable for flexible MDF award no marks.</p> <p>If product given with a list: max 2 marks.</p>
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3			<p>Joining Method</p> <p>Fitting a hard board sheet to the back of flat-pack book case</p> <p>Securing the top and bottom pieces to the side panels of a flat-pack book case</p> <p>Fitting a decorative trim to the base of a flat-pack book case</p> <p>Fitting a polymer handle to a drawer front</p>	<p>Component</p> <p>B</p> <p>A</p> <p>D</p> <p>C</p>	4	
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Question	Part	Sub Part	Marking Guidance	Mark	Comments
4	a		<p>The symbol means that the substance is harmful or irritant ONLY</p> <p>Do not accept toxic, hazard.</p>	1	Accept one word answers.

Question	Part	Sub Part	Marking Guidance	Mark	Comments
4	b		<p>E.g. solvents such as Tensol, adhesives like acrylic cement, epoxy resin, contact adhesive, cleaning products such as turpentine substitute, cellulose, bleach, superglue, dichloromethane (Di-clo), thinners, various finishes e.g. polyurethane varnish, cellulose paints, etc.</p> <p>Accept branded products, eg white spirit, araldite, cascamate, extramite.</p>	1	For 1 mark accept 'varnish' 'paint'
4	c		<p>E.g.</p> <p>The substance would have to be kept in a suitable container with the correct labelling (including the COSHH symbol, details of how to use the product safely and what to do in the event of swallowing or splashing in the eyes, etc).</p> <p>A risk assessment would be carried out to assess the hazards associated with using this product and to identify how the risk could be reduced.</p> <p>Personal protective equipment might be used such as goggles and an apron.</p> <p>The product might have to be used in a well ventilated area to reduce the hazard of fumes.</p>	6	1-2 marks per relevant point. Award additional marks for detailed explanation/exemplification.

Question	Part	Sub Part	Marking Guidance	Mark	Comments
5	a		<p>E.g. Aluminium is non ferrous so it does not rust. It can be left outside in all weathers without adverse effect. Aluminium is lightweight which makes it easy to lift, move around and stack. These chairs are often used in bars and restaurants where they would need to be moved around frequently. Aluminium has good tensile strength properties which would resist the bending forces of the chair being sat on.</p>	6	<p>1-2 marks per relevant point. (Award second mark for additional explanation).</p> <p>Award max 3 marks for a list of properties.</p>
5	b		<p>Possible answers may include:</p> <p>Use of power hacksaw and 'stops' to cut parts to set length Use of pipe bender & 'stops' or use of bench mounted fixtures to facilitate replication of bends Use of welding jigs to clamp parts together for accurate welding. May make specific reference to welding process e.g. MIG, or TIG- describing equipment. Possible description of shaping the seat and back rest. Use of drilling jigs or templates to drill pilot holes for riveting Use of spacers to facilitate accurate placement of slats for seat and backrest whilst riveting. Don't credit reference to manufacture of the tube or sheet.</p>	10	<p>Mark breakdown:</p> <ul style="list-style-type: none"> • Very simple diagram with inaccurate and basic description e.g. hand cutting with 'saw', basic torch flame and generic 'welding' given, no reference to batch (0 – 4 marks) • Better diagram showing some further detail e.g. pipe bending, clamps, welding rod, and torch (if MIG/TIG described). Possibly names 'MIG' welding and may confuse between several different methods. (5 – 6 marks) • A detailed answer with ref to cutting stops, bending fixture, comparing parts to drawing or 'standard parts', welding jig, spacers and so on. Must have reference to batch. (7 – 10 marks)


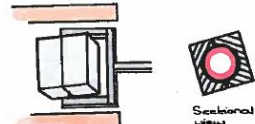
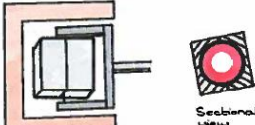
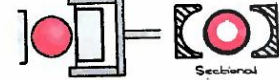
Question	Part	Sub Part	Marking Guidance	Mark	Comments
5	c		<p>Accept description of powder coating or spray painting with acrylic based or cellulose based paints.</p> <p>No mark for 'paint'.</p> <p>Accept Anodizing</p> <p>Accept polishing only with a lacquer</p> <p>Alternatively accept brushed or sand blasting finish.</p> <p>Expect reference to improved aesthetics</p> <p>Aluminium tends to tarnish/oxidise with exposure to air which makes it look dull and unattractive. Painting will help to prevent this.</p> <p>Accept chrome plating as a suitable finish for the chair.</p>	4	<p>Breakdown:</p> <p>Specific finish named (1 mark)</p> <p>Brief description of how it is applied (1 – 2 marks)</p> <p>Correct explanation of why it is suitable (1 – 2 marks)</p> <p>Max 4 marks</p>
6	a	i	<p>PET Drinks bottle</p> <p>PET is a thermoplastic which means it can be blow moulded. This is the process that would be used to manufacture the drinks bottle.</p> <p>PET is flexible which means that the drinks bottle will not break easily if dropped. It can then be used in vending machines.</p> <p>Because PET is a thermoplastic, it can be recycled easily. This is important because drinks bottles have a very short</p>	6	<p>1-2 marks per relevant point. Award second mark where point is explained.</p> <p>Max 3 for list of properties.</p>

			<p>lifecycle and they end up quickly into the waste stream.</p> <p>PET is available in transparent form (possibly tinted with a colour). This is important so that the consumer can see the contents clearly which is an important marketing feature. Tints of blue or green evoke a feeling of freshness which is an important aesthetic quality.</p> <p>Food safe – non toxic</p>		
6	a	ii	<p>Veneered MDF Dining Table</p> <p>MDF is available in long, wide boards which means it is quick to make a large flat surface such as a table top.</p> <p>MDF is very stable, which means it does not warp with changes in temperature. This means that the veneer would stay flat and not crack. Natural timber tends to swell and contract and may warp which leads to veneers cracking and coming off. Accept reference to no grain problems, etc. The veneer is available in a wide range of timbers which means a wide variety of colours can be selected for aesthetic purposes.</p>	6	<p>1-2 marks per relevant point. Award second mark where point is explained.</p> <p>Reference to 'cheap' alone = zero.</p> <p>If compared to natural timber give credit.</p> <p>Cheap compared to solid timber = 1 mark. Cheap compared to oak = 2 marks.</p> <p>Max 3 marks for list of properties.</p>
6	a	iii	<p>Recycled unbleached card</p> <p>Unbleached card can be made from paper pulp and moulded into the shape of a liner or tray to fit the mobile phone, = 1 mark</p>	6	<p>1-2 marks per relevant point. Award second mark where point is explained.</p> <p>Award maximum 4 marks if each of the 3 bullet points have <u>not</u> been addressed.</p>

			<p>So protects from impact = 2 marks. Accept reference to the use of unbleached sheet card, eg ability to be folded, etc.</p> <p>Card is a sustainable material because it can be made from recycled paper pulp. The original paper could have been sourced from FSC managed forests.</p> <p>Card is biodegradable . As packaging, would not be kept, if it went to landfill, it would degrade safely.</p> <p>As aesthetics are not really important for the interior of the box, the surface can be grey and have a rougher surface as printing would not be required.</p>		
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Question	Part	Sub Part	Marking Guidance	Mark	Comments
6	b		<p>Possible answers:</p> <p>Expanded polystyrene is an alternative. It can be injection moulded to fit the shape of the phone, charger, etc.</p> <p>Alternative:</p> <p>HIPs can be used as an alternative. It can be thermoformed into a tray with recesses to fit the phone, etc.</p> <p>Accept PP PET Carton board Biodegradeable plastics Bleached card</p>	2	1 mark for alternative 1 mark for relevant explanation.

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	a	i	<p>E.g. Polypropylene is a thermoplastic that is suitable for rotational moulding. It is a tough polymer which means it can withstand considerable use.</p> <p>P.P. is lightweight which means the seat would be easy to move around by children. Like all polymers, it can have a coloured pigment added in the moulding process which means it does not have to be painted and the colour would not wear off.</p> <p>Completely waterproof and if stabilisers added to the resin, resistant to sunlight/UV</p> <p>Accept reference to; durability, hygienic, non toxic.</p>	6	<p>1-2 marks per relevant point. (2 marks where point is explained).</p> <p>Max 3 for list of properties.</p>

7	a	ii	<p style="text-align: center;">Rotational Moulding</p>  <p>1. Open mould is filled with plastic powder.</p>  <p>2. Mould is heated and the plastic melts, coating the inside.</p>  <p>3. Mould is cooled to set the plastic.</p>  <p>4. Mould is opened and the product removed.</p> <p>Description: Stage 1- polymer powder and pigment is inserted into the open mould Stage 2- mould is closed and rotated Stage 3- mould moves into a heating chamber whilst rotating continues. Stage 4- polymer powder melts and builds up around the inside surface of the mould. Stage 5- mould moves into a cooling chamber Stage 6- polymer cools and product hardens. Stage 7- mould is opened and the product is removed.</p>	10	<p>Breakdown:</p> <ul style="list-style-type: none"> • Simple description with little detail. Diagrams are basic with incorrect labels or incomplete parts (0 – 4 marks) • Better description using correct terminology. Diagram mostly complete and correct (5 – 6 marks) • Full description. Correct /complete diagram. Detail includes terminology (7 – 10 marks) <p>For full marks the mould should resemble the product.</p>
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Question	Part	Sub Part	Marking Guidance	Mark	Comments
7		i	<p>Possible answers might include:</p> <ul style="list-style-type: none"> • Very smooth, rounded surface makes it easy for the child to slip off. The seat could have a texture added. Handles could be added as ears. • Narrow seat doesn't support the bottom very well. The seat could be widened to give more support. • There is no back rest which means the child can't lean back and relax • The seat would be hard and uncomfortable to sit on because it does not have any cushioning. A soft cushion could be inserted into the seat to make it more comfortable. 	9	<p>Breakdown:</p> <p>No diagrams and basic points without explanation. Little consideration of data table. (0 – 3 marks)</p> <p>Basic diagrams. Some points explained with some of data table dimensions discussed with some evaluation. (4 – 6 marks)</p> <p>Good diagrams. Most points explained including most/all of the dimensions in the data table. Comments are evaluative, making comparisons to the data and target market. (7 – 9 marks)</p>

7	b	ii	<p>E.g.</p> <ul style="list-style-type: none"> - Lift up lid forming the seat/back of the dog with storage under - Lift up lid on the head of the dog with storage for small items - Features such as coat or cover with buttons and laces for children to practice with. Head features – eyes – horns/ears. - Integrated shape sorter or puzzle - Use of thermochromic pigment to add interest. <p>The design must be a development using the basic shape of the dog and not a totally new product. If not a dog award zero marks.</p>	10	<p>Award 1-2 marks per design feature drawn/described. Refer to levels to award final mark.</p> <p>Breakdown</p> <ul style="list-style-type: none"> • Specification points are not fully addressed. Diagrams are basic and notes are limited. (0 – 3 marks) • Specification points are addressed. Better diagrams with some explanation in notes. (4 – 6 marks) • Specification points are fully addressed. Good diagrams with all relevant points explained. (7 – 10 marks)
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7	b	iii	<p>E.g.</p> <p>Changes to mould for rotational moulding to facilitate cut out sections Or recognition that it can no longer be blow moulded. Use of blow moulding/injection moulding small parts e.g. lift up lids, shapes for sorters, etc Manufacture of supplementary components. Possible reference to applied finishes or graphics using vinyls, or integrated with the polymer (thermochromics) Do not double penalise – if part (b)(ii) has re-designed a new product. Give credit for recognition of appropriate manufacturing method.</p>	5	<p>Breakdown:</p> <ul style="list-style-type: none"> • Basic answer with little reference to specific changes in the manufacturing process (0 – 2 marks) • Better answer with reference to specific materials/manufacturing process (3 – 5 marks)
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