



General Certificate of Education (A-level)
June 2011

Design and Technology:
Product Design

PROD1

(Specification 2550)

Unit 1: Materials, Components and Application

Post-Standardisation

Mark Scheme

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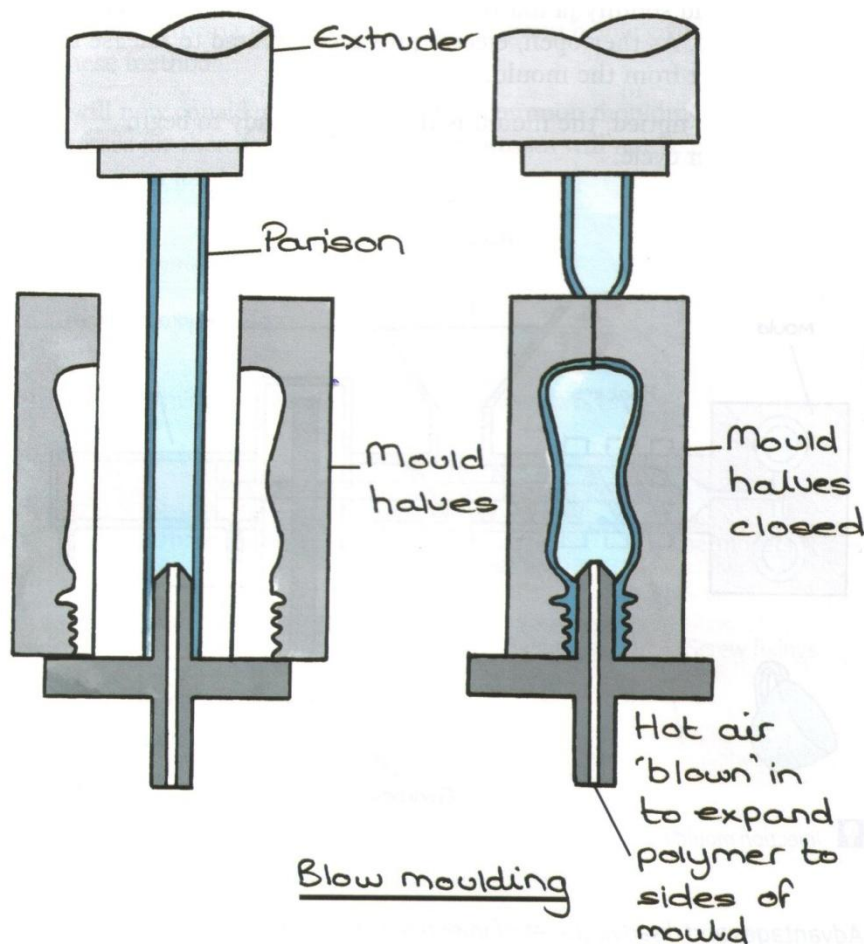
Question	Part	Sub Part	Marking Guidance			Mark	Comments
1	a		A mixture of two or more metals Don't accept 'elements'			2	2 or zero marks only
1	b		Stainless steel Kitchen sink If alloy not named or incorrect award zero for (b)			1 1	Accept aluminium <u>Alloy</u>
2	Applicat ion	Joining aluminium tube to aluminium tube to make a cycle frame	Joining copper to copper to make jewellery	Joining mild steel angle to mild steel angle to make a workbenc h frame	1 1 1	One mark for each correct answer. Note If candidate uses same fabrication method more than once – only award the mark once.	
	Fabricati on Method	MIG welding	Soldering	Arc welding or MIG welding			
3	a		E.g. Sheet (or board) PSE (Planed square edge) Accept dowel, angle or similar moulding and veneer			1 1	Accept: PAR, PBS, Planed, Rough sawn, Plank, Beam
3	b		E.g. Oak is highly durable (resistant to wear and tear) that will last many years giving the consumer value for money. E.g. Oak has an attractive colour and grain pattern which suits contemporary tastes. Not hardwood only			4	2 marks for each reason. Award 1 mark for one word answers e.g. "it's durable", "it's aesthetically pleasing". Max 2 marks for list of properties
4	a		A thermoplastic is a polymer that can be reshaped by the application of heat. It has loose monomer chains that will reform when heated and therefore it can be recycled.			2	Must mention use of heat for 2 marks
4	b		E.g. ABS Casing for a vacuum cleaner			1 1	
5			Cutting vinyl lettering	3D machining of a block of MDF	Cutting and engraving acrylic sheet	1 1 1	1 mark for each correct answer. Note If candidate uses the same piece of equipment more than once – only award the mark once.
			CNC plotter – Cutter or CNC laser cutter	CNC Router	CNC laser cutter or CNC router		

Question	Part	Sub Part	Marking Guidance	Mark	Comments
6	a	i	<p>SMA reacts to temperature so when the braces are placed onto the teeth by the dentist, they will react to body temperature, contract and tighten</p> <p>SMA is an inert material which is important as it will be used in the mouth so you would not want it to corrode or react to liquids</p> <p>SMA such as Nitinol is a non toxic material and is therefore perfectly safe to use in the mouth.</p>	6	<p>Mark breakdown:</p> <p>1-2 marks per point. Award second mark where explanation of the relevance of the property is given.</p> <p>Accept ref to aesthetic qualities of Nitinol.</p> <p>Generic list max 3 marks.</p>
6	a	ii	<p>Photo quality paper will give a high gloss which is necessary for a professional finish on point of sale displays. (Ref to printing qualities)</p> <p>Photo quality paper can be laminated onto a card or polymer backing that the POS display might be constructed from</p> <p>Photo quality paper is made from sustainable sources so its environmental impact can be kept to a minimum.</p> <p>Recycling</p>	6	<p>Mark breakdown:</p> <p>1-2 marks per point. Award second mark where explanation of the relevance of the property is given.</p> <p>Accept ref to making techniques including hand and commercial methods.</p>
6	a	iii	<p>Polymorph granules bonds together with the application of gentle heat (approx 60 degrees) so they can be easily shaped.</p> <p>Polymorph will give a similar finish to injection moulded polymer which is useful to show users/clients.</p> <p>E.g. Polymer can be painted to simulate the colours of an injection moulded product.</p> <p>Ignore references to a production version e.g. toxicity.</p>	6	<p>Mark breakdown:</p> <p>1-2 marks per point. Award second mark where explanation of the relevance of the property is given.</p> <p>Accept ref to re-using or reshaping to make further models.</p>
6	b		<p>MDF</p> <p>It can be shaped easily into the form of a handle by cutting with hand tools and sanding with glass paper.</p>	2	<p>Accept appropriate alternatives e.g. foamboard Styrofoam, clay, plastecine or modeling clay, resin, model board. Balsa, Acrylic, RPT material etc.</p> <p>1 mark for material 1 mark for reason</p>

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	a		E.g. Stainless steel	1	(Accept mild steel or aluminium) Duralumin
7	b		<p>E.g. Stainless steel is a very hard material and will withstand attempts at vandalism e.g. scratching.</p> <p>E.g. Stainless steel does not corrode and therefore will withstand the effects of weather.</p> <p>E.g. Stainless steel has an attractive silver colour which looks appealing in a modern street environment.</p>	6	<p>Mark breakdown:</p> <p>1-2 marks per reason. Award second mark where explanation is given for relevance of the property.</p> <p>If no metal named in (a), award zero for (b).</p> <p>If unsuitable metal award marks for relevant properties.</p>
7	c		<p>Answer may include notes and diagrams of the following:</p> <ul style="list-style-type: none"> • Cutting bar/tube to length with power hacksaw with a stop/ in a cutting jig to remove need for measuring. Alternatively buy in steel cut to length. • Bending of tube (in pipe bender), bar over a jig or fixture following heat treatment. • Clamping of parts together. Possible use of jigs/fixtures/spacers to achieve consistent parallel parts. <p>May describe welding process but only award upto half marks if no ref to batch production.</p> <p>Ignore ref to manufacture of the bars e.g. extrusion.</p>	9	<p>Mark breakdown:</p> <p>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 production. (0-3 marks)</p> <p>Better diagram showing some further detail e.g. clamps, welding rod and torch (if gas welding described). Possibly names 'electric arc' welding and may confuse between several different methods. (4-5 marks)</p> <p>Diagrams and notes make reference to batch production e.g. clamping over former/welding fixture. (6-7 marks)</p> <p>A more detailed answer with ref to cutting stops, bending fixture, comparing parts to drawing or 'standard parts', welding jig, spacers and so on. (8-9 marks)</p>

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	d		<p>A welding visor is used to protect the eyes from the UV light caused by the flash of the electric arc.</p> <p>Extractors are used to remove toxic gases from the welding area.</p> <p>Personal protective clothing e.g. gloves, overalls and safety boots to protect from cuts, oils, etc. <u>(note only 1 mark for a list of different PPC).</u></p> <p>Training of workers to prevent accidents. Familiarise workers with risk assessments.</p>	4	<p>Mark breakdown:</p> <p>1-2 marks per precaution. Award the second where the reason for the precaution is given.</p>
8	a	i	<p>Accept :Polypropylene (PP), Low Density Polyethylene (LDPE), High Density Polyethylene HDPE, PET, Thermoplastic Elastomer (TPE). Not PVC, Not ABS, Not Acrylic, Not PS/Hips</p>	1	
8	a	ii	<p>E.g. Polypropylene is a thermoplastic which can be extrusion blow moulded which is the most likely process to manufacture the bottle.</p> <p>E.g. PP can be given a variety of pigments to colour the product for aesthetic purposes</p> <p>E.g. P.P is lightweight which is good as the liquid contents would make it heavy to carry anyway.</p> <p>Alternatives might include ref to material being non toxic, highly durable to withstand the rigours of running, impact resistant because should items would be dropped, etc.</p> <p>N.B. Don't penalise if thermoplastic in (ai) is incorrect, award marks for relevant properties of named plastic in (ii).</p>	6	<p>Breakdown:</p> <p>1- 2 marks per relevant point. 2 marks where point is explained or further detail given.</p> <p>If generic list max 3 marks.</p> <p>N.B. Don't double penalise if thermoplastic in (a)i is incorrect, award marks for relevant properties of named plastic in (ii).</p>

Question	Part	Sub Part	Marking Guidance	Mark	Comments
8	a	iii	<p>Accept only extrusion blow moulding or blow moulding from a hollow bottle shaped preform.</p> <p>The polymer is extruded in a tube form known as a 'Parison'.</p> <p>The mould halves close on the 'Parison' and trap the base together. Air is blown into the Parison which is forced out to the sides of the mould where it cools.</p> <p>The moulds open, releasing the product.</p> <p>Flash is removed.</p> <p>If injection blow moulding is described, award marks only up to middle mark band (see additional notes) (max 6)</p>	9	<p>Mark breakdown:</p> <p>Simple description with little detail. Diagrams are basic with incorrect labels or incomplete parts (0-4 marks)</p> <p>Better description using correct terminology. Diagram mostly complete and correct (5-6 marks)</p> <p>Full description. Correct /complete diagram. Detail includes terminology e.g. (7-9 marks)</p>



Question	Part	Sub Part	Marking Guidance	Mark	Comments
8	b		<p>Answers will be varied but may include in their notes and diagrams details as follows:</p> <ul style="list-style-type: none"> Product will need to fit the palm line for the 50th percentile. Maybe comments that it appears too wide. Texture on the sides to aid grip whilst running Shaping on edges to hold firmly whilst running. Some may suggest modification e.g. centre moulded to fit hand through or moulded in handle on the side. Some may suggest the addition of handle/body coated with LSR/TPE to provide additional grip. The top has a textured edge so that it is easy to grip and undo for filling up. The bottle has been fitted with a gauge to show full the product is, or to measure out specific sports drink ingredients. The bottle top is made from TPE or LSR which is soft to the lips. The pull top is designed to be opened by the user's teeth. Standardised shape to fit in a variety of carriers/holders Polymer is lightweight and therefore easy to carry 	10	<p>Mark breakdown:</p> <p>Basic diagrams. Largely descriptive comment with very little analytical. (0-3 marks)</p> <p>Better diagrams. Some analytical comment. (4-7 marks)</p> <p>Clear diagrams, appropriately annotated with good analytical comment. (8-10 marks)</p> <p>IF NO DIAGRAMS MAX (5 marks)</p> <p>IGNORE REFERENCES TO COLOUR.</p>

Question	Part	Sub Part	Marking Guidance	Mark	Comments
8	c		<p>Credit:</p> <ul style="list-style-type: none"> • Features that add value e.g. re use of the package, cooler, zipped bag, etc. • Reducing the materials • Use of recycling/ recycling materials including starch based polymers. • Printing of the recycling symbol • Use of colours and logos to attract customers • Use of the euro slot to hang packaging • How the package will be manufactured e.g. staples; crimping of plastic sides, etc. • Biodegradable materials 	14	<p>Mark breakdown:</p> <p>Basic diagrams with few of the criteria listed in the question addressed. Simple notes about the material, making process and obvious statement about the environment. e.g. Drawing of simple 'card' box with little styling detail. Made by cutting and folding card. 'Can be recycled'. (0- 4 marks)</p> <p>Better design with some styling/shaping to the package. Possibly specific material(s) named. Technical terms used such as 'net', scoring, etc. may describe using recycled materials. (5-9 marks)</p> <p>Clear diagram(s) with an appropriate design for the package with aesthetic appeal. Some innovative features in the styling/method of holding the bottle. Specific material(s) named. Technical terms for manufacturing/finishing e.g. press-knife, off-set litho or digital printing, description of using less material, recycled/recyclable material, eco-friendly inks, etc. If plastic bag –starch based polymers used. (10-14 marks)</p>