
GCSE

Design and Technology:
Product Design

Unit 1 Written Paper
Mark scheme

4555
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Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

Question	Part	Sub Part	Marking Guidance	Mark	Comments
1	a		<p>Typical criteria are:</p> <ul style="list-style-type: none"> • Store/hold money +change/coins/notes. • Easy to assemble • Possible to gain access + to take money out • Handle/can be carried by user + so can be used in public places e.g. shopping centres. • Use appropriate materials + to securely support and hold contents so they don't fall out of the bottom due to weight. • Indicate charity on container + so the public know what organisation/event is being collected for. • Slot big enough + accept all coins sizes 	6 x 1 marks	<p>1 mark for each design criteria and 1 mark for each matched reason.</p> <p>Flat pack = 0 Innovative = 0</p> <p>Expect to see reference to: Contain secure</p>
1	b		<p>12 -15 marks</p> <p>Very innovative design highly suited to collection of money. All design criteria points addressed. It must be flat pack & hold money.</p> <p>Clear and correct material (s) given and detailed construction techniques.</p> <p>A detailed 2D net development and/or 3D of package showing clearly how solution would work, be assembled/goes together before use. Glue, fold & lock tabs accurate. Must show how money will be retrieved. Drawing correctly proportioned. Possible evidence of dimensioning included. N.B. An exceptional 2D net or 3D drawing may just access top band marks.</p> <p>Excellent use colours, tones and to enhance surface decoration and communication.</p>		<p>N.B. Maximum of 10 marks if design does not meet one of the bullet points e.g. not flat packed/ no surface decoration.</p>

			<p><i>N.B. Very innovative is something other than a basic cube box. Will include high level of surface decoration detail, interesting shape and/or features.</i></p> <p>8-11 marks Predictable idea for money box lacking creativity. Most design criteria points addressed.</p> <p>Attempt to name appropriate materials and how solution may be constructed.</p> <p>Accurate and detailed 2D net development and/or 3D of package showing some detail of how solution is assembled/goes together before use. Glue, fold & lock tabs evidenced. Some suggestion to show how money will be retrieved. Drawing correctly proportioned. Possible evidence of dimensioning included.</p> <p>Good use colours, tones and to enhance surface decoration and communication.</p> <p>4-7 marks Response lacking significant detail. Few design criteria points considered.</p> <p>Limited material identification and basic/ superficial constructional detail.</p> <p>Use of 2D net development or 3D of package drawing to clarify design idea. Very limited assembly information. Little or no reference to how money will be retrieved.</p>		
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			<p>Very limited use of colours or tone to enhance surface decoration and communication.</p> <p>0-3 marks Unclear and incomplete response. No design criteria points considered.</p> <p>No material identification and no obvious constructional detail.</p> <p>Simple drawing to produce a recognisable design idea.</p> <p>No use of colour or tone to enhance surface decoration and communication.</p> <p>No attempt = 0 marks</p>		
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1	c		<p>Evaluation of suitability against any points made in design criteria for 1a:</p> <ul style="list-style-type: none"> • Can design be flat packed? • Store/hold money +must hold all UK coins. • Possible to gain access + to take money out • Handle/can be carried by user + so can be used in public places e.g. shopping centres. • Use appropriate materials + to securely support and hold contents so they don't fall out of the bottom due to weight. • Indicate charity on container + so the public know what organisation/event is being collected for. • Slot big enough + accept all coins sizes 	6	<p>3 marks One evaluative point clarified in depth.</p> <p>2 marks One evaluative point clarified in some detail</p> <p>1 mark Simple evaluative points</p> <p>0 marks No response/ incorrect response.</p>
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1	d		Die cutting/stamping/punching/die press. Laser cutting = 0		1 mark
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1	e		<p>Rubbish in the bin. Example responses are:</p> <p>Encourage people to put rubbish in the bin Dispose of litter in the correct way</p> <p>Put rubbish in the bin Non-toxic</p> <p><u>Registration marks</u> Example responses are:</p> <p>To check alignment of printed images and also colours used for printing e.g. cyan, magenta, yellow and black. Can Used as a Quality Control measure. Used for offset lithography printing Registration mark</p>		<p>Any two simple points OR 1 point clarified for 2 marks.</p> <p>Any two simple points OR 1 point clarified for 2 marks.</p> <p>4 colours used when printing =1</p> <p>Printing on target/right place = 1</p>
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Question	Part	Sub Part	Marking Guidance	Mark	Comments
2	a			5	<p>4 x1</p> <p>1 mark of each label (as given) or written label correctly added to the diagram.</p> <p>NB All five correct still a max award of 4 marks.</p> <p>Each label MUST be in its correct box.</p>
2	b	i	<p>Just in time production:</p> <p>Where each part of a product /component arrives/is planned to arrive on the production line just in time to be added to a bigger product or object.</p> <p>Products delivered as needed.</p> <p>Bought in components already QC checked.</p> <p>It allows manufacturers to avoid over buying of components/parts and save on the storage of raw materials and parts in their own factory.</p> <p>Expensive if components are late/ delayed and production has to stop.</p>	3	<p>2 points with 1 explained = 3 1 point explained = 2 List of simple points = 2 max</p> <p>May use an appropriate example to support response.</p>
2	b	ii	<p>Continuous production:</p> <p>The production line never stops. Products are made over days, weeks even years without stopping e.g. bottles and containers, newsprint, screws etc.</p> <p>Heavily automated production,</p>	3	<p>2 points with 1 explained = 3 1 point explained = 2 List of simple points = 2 max</p> <p>May use an appropriate</p>

			<p>producing a limited range of products with only a few less skilled workers.</p> <p>Production output is very high. Cost of the plant and equipment purchased for use is very high.</p>		<p>example to support response.</p> <p>Continuously (repeat of Qu) =0</p> <p>Sandwiches as e.g. = 0</p>
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2	c		<p>Barcodes</p> <p>Manufacturing issues:</p> <ul style="list-style-type: none"> • Stock control- how many parts/components are left before re order is required? • Identify part numbers – rapid ID of variations in colour, size, shape, source. • Automation – can be scanned by machine to ensure correct component is being installed/ assembled. <p>Selling issues:</p> <ul style="list-style-type: none"> • Scanning to identify product price/ sell by dates. • Check on consumer buying trends. • Loyalty points e.g. clubcard points • Pricing of product(s) 	3	<p>Any 3 valid points = 3</p> <p>2 points with an example of use = 3</p> <p>Scan =1</p>
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2	d		<p>Ways of using CAD/CAM to ensure less waste:</p> <p>CAD:</p> <ul style="list-style-type: none"> • Virtual testing of materials prior to adoption. • Paperless recording of vital information • Electronic data transfer – avoiding transport costs i.e. fuel • Electronic simulation of designs and components to check if they will work. • Idea presentation to customers using powerpoint (or similar) to avoid material 	4	<p>Two ways for either CAD or CAM identified and described = 4</p> <p>4 listed points (no description)= 2 max</p> <p>Might lean towards CAD responses so reward appropriately i.e. not a 50/50 split.</p> <p>NB If only CAD or</p>
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			<p>use.</p> <ul style="list-style-type: none"> • Planning for production e.g. nesting of multiple work pieces if to be cut from one piece of material. <p>CAM:</p> <ul style="list-style-type: none"> • Removal of human error, so less waste. CNC machines are very precise. • Accuracy – some machines check own accuracy during manufacture. Less faulty components/ out of tolerance components. • Production methods using readily recyclable materials – injection moulding of polymers • Reduced finishing of materials and components e.g. laser cut edges require no further finishing, garment dying to order. • Accept reference to JIT e.g. manufacturing to order. • Buying to order e.g. individual spec. on a car avoiding oversupply. • Modern packaging (flat pack) and delivery systems 		<p>CAM considered NOT BOTH then award 3 marks max.</p>
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Question	Part	Sub Part	Marking Guidance	Mark	Comments
3	a		Check table below:	9	<p>Product mark: 1 mark for correctly matched product to process.</p> <p>Reason: A simple reason =1 mark. A reason clarified (detailed process suitability) gets 2 marks.</p> <p>No repeated products.</p>

Process	Product	Reason for process suitability
Injection Moulding	<p>Plastic washing Up Bowl</p> <p>Exterior case of digital radio</p> <p>Fruit juice container</p>	<ul style="list-style-type: none"> • Process allows for a one piece, moulding to be made. • They are made in large numbers rapidly for a relatively low cost. • Waste materials can be shredded are reused in production process again.
Blending	<p>Polyester/cotton Shirt</p> <p>Sponge cake</p>	<ul style="list-style-type: none"> • Cotton and polyester blended to make a more durable shirt and make is wash better. • To make an even cake mixture
Lamination	<p>Digital radio – the PCB</p> <p>Wooden salad servers</p> <p>Christmas cracker</p> <p>Fruit juice container</p>	<ul style="list-style-type: none"> • Bonding of copper film to film to fibreglass or cardboard durability whilst maintaining a conductive surface on an insulating material. • Bonding of wood veneers e.g. beech to make a more visually appealing (aesthetic) product. Ergonomic design for user. • Bonding of a foil/decorative film to the surface of card for enhanced appearance. • Bonding of foil/plastic liner to card to create a waterproof container. • ACCEPT LAMINATED TO GIVE

	Tissue box	STRENGTH <ul style="list-style-type: none"> • Bonding of a surface film to the box.
Aeration	Sponge cake	<ul style="list-style-type: none"> • Makes the cake light and airy, giving it a better texture.
Surface mounting	Digital radio	<ul style="list-style-type: none"> • Allows for smaller, more reliable PCBs to be made. • Reduced material consumption equals less weight so easier to carry/portable products e.g. smartphones. • More cost efficient - as fewer materials are used (due to reduced size) and quicker manufacturing as component holes do not need drilling.
Screen printing	Silk tie Polyester shirt Card tissue box	<ul style="list-style-type: none"> • Printing on of additional colours/pattern/design.
Welding	Steel climbing frame	<ul style="list-style-type: none"> • Allows metal components to be joined in a permanent, durable fashion to create the frame structure required. • Ease of replication- component parts can be held in jigs for accurate welding.
Perforation	Card tissue box Christmas Cracker Fruit juice container	<ul style="list-style-type: none"> • Perforation allows for ease of removal of lid/hole in tissue box to access contents. • Perforation in crackers for ease of separation to access gift and joke. • Aid removal of drink spout
Glazing	Toffee apple Ceramic tea pot	<ul style="list-style-type: none"> • Sugar glaze to enhance appearance, texture and taste of a plain apple. • Glazing to seal surface and improve preservation. • Seal the surface of the ceramic used, improve durability, enhance colour and appearance and make it waterproof.

	Sponge cake	• Icing sugar glaze
	Polyester shirt	• Gloss finish to improve surface handle/shiny finish
	Tissue box	• UV varnishing/glaze.

3	b	i	Product	Main material	1	Any correct named specific material = 1 Wood, metal, plastic, cloth, clay, ceramic, food = 0
			Coat	Nylon/ polyester		
			Fruit pie	Fresh fruit, flour, fat.		
			Flat pack Furniture	MDF, chipboard, plywood or named timber.		
			Sketch pad	Bleached white paper Solid whiteboard Cartridge paper Card Duplex board Steel- for binder		
			Meal box	Cardboard/Duplex card		
			Shampoo bottle	LDPE/HDPE		
			Garden shed	Pine		
			Glazed vase	Earthenware, slip		
			Wine holder	Steel/ chrome steel		

3	b	ii	Product	Stock form	1	Any correct named stock form =1
			Coat	Fabric by: Roll, ply & weight		
			Fruit pie	Any appropriate fresh, frozen, dehydrated, liquid or canned ingredient Block of pastry. Tub/block of fat or butter.		
			Flat pack Furniture	Timber: Rough sawn, planks, planed square edge (PSE), veneers, lamins & mouldings. Manufactured: Sheet & board.		
			Sketch pad	Paper size e.g A2, A3 & A4 Thickness (microns)		

				Weight (grams)Sheet		
			Meal box	Card size, thickness (microns) and weight (grams)Sheet		
			Shampoo bottle	Sheet, rod, powder, granules & foams.		
			Garden shed	Sheet, board, veneer, lamins, rough sawn, planed square edge (PSE), & mouldings. Tongue & groove.		
			Glazed vase	Slip, body, pigment, & oxides		
			Wine holder	Sheet, rod, bar & tube.		

3	c		Available in stock or standard forms because: Easier to buy – recognised shapes, sizes & quantities. Lower price and more readily available. Primary processing already completed- improve consistency and quality Easier to handle, transport and store.	3	Simple explanation points= 1 mark each. One explanation point clarified in detail = 2 marks One simple explanation and a second clarified in detail = 3 marks. Two detailed explanation = 3 marks.
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Question	Part	Sub Part	Marking Guidance	Mark	Comments
4	a		See table below: Response in bold	6	Simple explanation = 1 mark Qualified explanation = 2 marks. No direct repeats.

Reasons for Packaging	Explanation
Preserve	Products like food need to be stopped to from spoiling due to temperature changes or bacteria
Inform	Provide the buyer with a picture of the contents or information needed by law.
Protect	Stop the product from getting damaged when in transit. Also stop tampering with the product by means of a security seal.
Transport	Allow for the bulk movement of lots of a product to a shop e.g. packed securely in boxes or crates.
Contain	Ensure a product with lots of small parts keeps them all together and so none get lost e.g. child's toy
Display	Make to product more appealing to the consumer so that they will buy it.

4	b	<p>QWC question Explain how manufactures are trying to reduce the impact of drink and food packaging on the environment – reference to:</p> <ul style="list-style-type: none"> • Recycling bins outside shops/outlets • Bags for life • Bins sponsored by manufacturers outside shops • Posters reminding consumers not to litter. • Use of bio-degradable materials e.g. potatopak & corn starch polymers. • Information for correct disposal on bottles, boxes etc. • Use of materials from a sustainable source e.g. card with FSC mark. • Retail/sale locally reducing big carbon footprint of exporting packaging • Habitat destruction/harm to the environment. <p>NOTE: PROVIDED IMAGES ARE THERE TO ELICIT RESPONSE. THEY CAN MAKE DIRECT REFERENCE TO ALL/SOME OR NONE OF THE INDICATED IMAGES.</p> <p>A fully detailed and comprehensive response that covers many of the points above. Use of 2 or more good examples about use of materials to clarify understanding of issues given. The answer is well structured, with a good use of D&T terminology and showing a very good grasp of grammar, punctuation and spelling.</p> <p>A detailed and comprehensive response with that makes use of several of the points above. Use of 1 or 2 examples or use of materials to clarify understanding of question issues given. Response has structure with good use of D&T terminology and shows a good grasp of grammar, punctuation and spelling.</p> <p>A fairly detailed response, which refers to some of the points above. A fairly well structured response, with some use of D&T terminology. Little or no use of examples to clarify understanding. Response does have a small number of errors in grammar, punctuation and spelling.</p> <p>A very limited response with little if any reference to the points above. The answer is vague and poorly structured, with little use of D&T terminology. Many errors in grammar, punctuation and spelling.</p> <p>A response with no reference to packaging or the environment</p> <p>No attempt = 0</p>	<p>8</p> <p>Quality of QWC may add to a mark award, but should not take marks away.</p> <p>7-8 marks</p> <p>5-6 marks</p> <p>3-4 Marks</p> <p>1-2 marks</p> <p>0 mark</p>
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Question	Part	Sub Part	Marking Guidance	Mark	Comments
5	a		<p>Clear sketch(es) with main features explaining a potentially feasible Design well suited to manufacture in quantity and/or sale at the market</p> <p>Sketch(es) with some features identified Design is suited to manufacture in quantity and/or sale at the market.</p> <p>Limited sketch(es) with little feature detail for one of the shortlisted products</p> <p>Design of a product not on the shortlist/ no attempt</p>	3	<p>N.B. Possible to get full marks without annotation for outstanding clarity in sketches.</p> <p>3 marks</p> <p>2 marks</p> <p>1 mark</p> <p>0 marks</p>
5	b		<p><i>Layout and order of processes:</i></p> <p>Well planned and feasible layout, order of processes and/or instructions. No major omissions.</p> <p>Generally correct layout, but some errors in sequence. Some omissions.</p> <p>Only part of a layout and order given. Superficial notes and instructions.</p> <p>No evidence of a layout or order for manufacture.</p> <p><i>Identification of appropriate tools</i></p>	6	<p>5 -6 marks</p> <p>3- 4 marks</p> <p>1-2 marks</p> <p>0 marks</p> <p><i>In rare cases, if a candidate omits information for 5b, there may be some content that can be arrowed across and credited from 5a.</i></p>

			<p>and equipment:</p> <p>N.B. Pencil =0; consumables like glue =0</p> <p>Correct and appropriate range of tools or pieces of equipment suited to product and appropriate for producing a batch of 50</p> <p>Mainly correct and appropriate tools or pieces of equipment suited to product and appropriate for producing a batch of 50.</p> <p>1 suitable tool or piece of equipment sited to product and appropriate for producing a batch of 50.</p> <p>No tools or equipment identifiable.</p> <p>Quality of communication:</p> <p>High quality sketches, notes and diagrams.</p> <p>Sketches and/or notes with details of limited quality.</p> <p>Very limited notes and/or sketches</p> <p>No attempt</p>	<p>3</p> <p>3 marks</p> <p>2 marks</p> <p>1 mark</p> <p>0 marks</p> <p>3</p> <p>3 marks</p> <p>2 marks</p> <p>1 mark</p> <p>0 marks</p>	
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5	c		<p>Test procedures could include:</p> <ul style="list-style-type: none"> • Visual checks • Dimensional checks • Go no Go tests • Taste testing • Texture testing • Flammability checks • Used of jigs/ repetition consistency • Ref to templates/plans • Third party testing • Free sample testing • Virtual testing • Field testing 	<p>4</p> <p>1 point +explanation = 2</p> <p>1 simple point = 1</p> <p>List of points in brief = 2 max.</p>	
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Question	Part	Sub Part	Marking Guidance	Mark	Comments
6	a	i	Benefits for retailer: <ul style="list-style-type: none"> Show/advertise product range they sell Efficient use of limited floor space e.g. display against the wall/ revolve. Portable PoS for seasonal products PoS can include security features to stop theft e.g. mobile phones Showcase new products 	2	Any 2 distinct valid points = 2 Must be for the retailer. Beware of repetition
6	a	ii	Benefits for consumer: <ul style="list-style-type: none"> Products in line with eye if wall mounted See new product promotion range Don't have to bend down low to pick up products. Products out of packaging so they can be handled Things you might have forgotten New products being launched Seasonable products High consumables e.g. batteries, wipes. 	2	Any 2 distinct valid points = 2 Must be for the customer. No repeats from 6(a)(i)
6	b		Explanation of Brand Identity: <ul style="list-style-type: none"> Promoting product strengths e.g. latest technology, customer care backup, product value for money. A product or company name that identifies the manufacturer with quality products. A brand that overcomes language/cultural barriers to reach customers and people know what it is e.g. Coke Cola trademark, Nike tick Use of a logo or trademark = 1 Instantly recognisable = 1	4	Point + clarification/example = 2 marks. Simple point = 1 mark 2 or more simple points = 2 max.

6	c		Promotional leaflet used for marketing purposes: <ul style="list-style-type: none"> • Reach local customers/ markets e.g. take away menu, dog walking services or similar • Mail drop/ posted through letter boxes • Hand outs by students in shopping centres, town centres e.t.c. to advertise promotions. • Holidays- hotel receptions to indicate events, what's on and where. To advertise = 1 To inform = 1	3	Point + clarification/example = 2 marks. Simple point = 1 mark 2 or more simple points = 2 max.
6	d		Manufacturers may use digital media to market products by: <ul style="list-style-type: none"> • Use of electronic devices e.g. PCs, firestick/dongle to connect to wi-fi, smartphones to engage with users • Digital media allows manufactures to track websites (cookies) etc. that potential customers are visiting and target them. • e-mailing/spam • Smartphone apps. • Electronic billboards at sporting events • Pop ups on websites and social media. 	4	Point + clarification/example = 2 marks. Simple point = 1 mark 2 or more simple points = 2 max. Adverts = 1 Pop ups = 1

Question	Part	Sub Part	Marking Guidance	Mark	Comments
7	a		Advantages of info provided by consumer/pressure groups includes: <ul style="list-style-type: none"> • Impartial reviews • Independent testing of products • Buy with confidence • Save time and uncertainty in buying products • Free advice/guidance • Opinions from experts • Help choose the right product for you • Compare products 	4	<p>Each benefit identified = 1 mark</p> <p>Benefit + qualified = 2 marks</p> <p>NB Allow a mark for a named consumer pressure group if used to qualify a response.</p> <p>Examples of consumer/pressure groups:</p> <ul style="list-style-type: none"> • Which • Consumers' Association • CAMRA (British campaign for real ale) • Consumer Action Group <p>Also allow:</p> <ul style="list-style-type: none"> • BBC Watchdog • BBC Rogue traders
7	b		Describe ways must link to smart TV: <ul style="list-style-type: none"> • Price/initial cost • Compare functions with other brands e.g. internet ready, surround sound, 3D, USB socket, screen size, HD e.t.c. • Ease of use/how easy is it to use • Durability • Guarantees • Aftercare packages <p>Compare price = 1 Look at features=1</p>	5	<p>Very full and detailed response with wide range of features considered =5 marks</p> <p>2 or 3 appropriate features that would be evaluated on the TV = 3 - 4 marks</p> <p>1 point explained in detail or 2 simple points made = 2 marks.</p> <p>1 brief point =1 mark</p> <p>No attempt/ incorrect features identified = 0</p>