
GCSE DESIGN AND TECHNOLOGY PRODUCT DESIGN

45551
Mark scheme

4555
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Version 1.0 Final

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		Questionnaires- sent out through post/internet to collect wide range of responses from different social groups. Use closed or open questions. Survey- carried out locally, targets specific consumers. Testing – consumer's given examples of images to look at and comment/feedback on. Telephone- cold calling to gather verbal feedback/opinion only Client interviews- a structured approach may be face to face or over telephone. Conducted personally. Consumer/client clinics. Online forum-conversations as posted messages Social Media Network sites e.g. twitter for thoughts	2x2 mark	1 mark for method 1 mark for explanation/extra detail. Ask questions = 1

1	b		12 -15 marks Very creative design highly suited to packaging of given mug. Excellent use colours, tones and given images. Ideas drawn in proportion using two or more recognised drawing techniques. Very accurate and detailed 2D net development and/or 3D of package showing clearly how solution goes together. Glue, fold & lock tabs accurate and proportioned. Evidence of dimensioning included. Detail or card/polystyrene insets. Locking tabs and security seals/stickers. Possible mention or corrugated card for lightweight protection etc. Evidence as notes of sketches of how mug will be secured. Not just placed in a box.		
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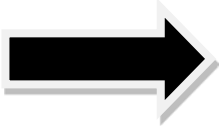
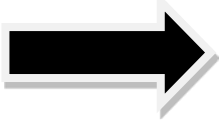
		Sketches and notes indicate clearly details of the product spec given and its features. Detail of barcode for stock control, symbols for correct storage and transport and package disposal. <i>N.B. Very creative is something other than a basic cube box. Will include viewing window, surface decoration, interesting shape and/or features.</i> 8-11 marks Predictable idea for packaging lacking creativity. One or two drawing techniques used. Some use of colour & tone. May not make effective use of provided images. One simple feature to show how product will be secured for transport or storage. Good 2D net development or 3D drawing of package with details of most glue, fold & lock tabs. Lacking accuracy and proportion in places. Good attempt to include a variety of appropriate and relevant package information. Some explanation through annotation. 4-7 marks Response lacking significant detail. Sketches with little or no colour and annotation. Evidence of some constructional detail. Accuracy and proportion will be lacking. Basic attempt to consider relevant package information. Symbols may be unclear and poorly located. Notes will be simplistic and lack detail. No attempt to consider package		
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			information. 0-3 marks Limited response lacking significant detail. Sketches with little colour or annotation. Limited and superficial constructional detail. Little or no evidence of how product will be secured. Little or no attempt to consider package information.		No attempt/failed to answer the question i.e designed a mug = 0 marks
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1	c		1 mark for one correct process 2 marks for two correct processes 3 marks for three/four correct processes		3 marks
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Chips of wood are cooked in water and chemical to make wood pulp.	Pulp is poured over a fine mesh.	Trees are cut and converted into logs.	Waste paper for recycling may be added	Cut logs are debarked
C	E	A	D	B

1	d	Five correct answers on table below	5 marks
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PROCESS		DESCRIPTION
Offset Lithography		A commercial printing method for paper and card.
Flexography		A technique used to print onto plastic film e.g. carrier bags.
Embossing		A decorative surface finish applied to paper and card.
Laminating		A process where at least two layers of material are fixed together.
Block Printing / Screen printing		A hand process used to create repeating patterns.
Dye Sublimation		Uses heat and is suitable for printing onto a wide variety of materials in short print runs.

Question	Part	Sub Part	Marking Guidance	Mark	Comments
2	a		Products evolve over time due to: Developments on new materials e.g. smart & modern materials Manufacturing changes e.g. automation, developments in CAM Changes in technologies e.g. biotechnology, nanotechnology, microelectronics. Social changes e.g. both parents working e.g. developments in microwaves, dishwashers, fridge freezer. Fashion e.g. seasonal changes in clothing. Healthy eating e.g. low fat, low sugar, fibre products.	2	Brief single word answer = 1 Any 2 brief points or one explained in detail = 2 Change over time =1
2	b		Decline in the use of milkmen (no one to collect milk bottles) Supermarket – milk sold in more than 1 pint units. Cartons are easier to stack. Environmental concerns - reducing waste materials. Weight – milk bottles are heavy and not suited to 2 pint milk containment. Transport- easier to move milk bags (no waste space between each bag) Safety- glass can break. Use – easier to carry and pour from jug. Jug can be resealed. Advertising- place an advert or promotion on the package. Market pull – demand for larger containers Tech Push- more efficient way of producing containers/no need to sterilise.	4	2X2 Point made = 1 Point made with explanation =2

2	c	Bottle Adv – easy to open Adv -Can see how much milk left. Adv -Bottle can be reused. Adv-Glass can be recycled. Dis- can smash. Dis – difficult to reseal. Dis – foil lid can get damaged. Dis - brittle or fragile HDPE Carton Adv- buy milk in a larger quantity. Adv – easy to freeze Adv – carrying handle moulded in Adv – can be recycled Adv – colour coded tops Dis- difficult to open (protective seal) Dis – tops sometimes leak. Dis -difficult to pour if old Milk bags Adv- minimal materials used for packaging (reduce). Adv- Polythene bags 100% recyclable (recycle). Adv- milk can be frozen for more convenient home storage. Adv – jug has handle easier to pour. Adv – sealable lid prevents contamination. Adv – jug reused when refilled with new bag of milk. Dis – bags can burst Dis – fiddly to put into jug initially. Dis – jug can smell unless washed regularly. Dis- bags thrown in with landfill waste/ bad for environment No repeats!!	9	9 x 1 Three acceptable responses for each milk container = 9 No repeats!! Harder to transport bags=0 Easy to store in fridge door(all are)=0 Costs more to buy jug =0 Jug is free! Costs more to initially make all parts for jug. OK if candidate talks about suitability of the material or the container design.
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2	d	Product miles Number of miles a product travels in its design & manufacture e.g. designed in the west, made in the east and sold in the west. Distance travelled from place of production to place of consumption Carbon Footprint Impact on climate change e.g. primary processing, secondary processing, transportation, energy during use, disposal & global	2 2	3 x 2 Mark for each point of understanding made. Ref. to travel = 1 One mark for an example to explain understanding.
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		warming. Amount of carbon produced by any human activity. Measured in units of carbon dioxide. Carbon emissions produced during the manufacture of a product Fairtrade Fair trade foundation set up to reduce poverty and hardship among farmers & workers around the world. Ensures workers receive a fair price for their products. Minimum price for sustainable production A partnership between traders and producers Investment in social or economic development projects. Often organic produce	2	Reference to farmer/ worker = 1 Pay a fair price =1
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Question	Part	Sub part	Marking Guidance	Mark	Comments
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3	a		Check table over		1 mark for single word response 2 marks for detailed hazard 1 mark for single word response 2 marks for detailed action
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Tool/Equipment	Potential Hazard	Action to minimise hazard
Soldering iron	• Risk of burn from heating element/tip. • Damaged/melted plug cable • Risk of electrocution	• Only hold the polymer/plastic handle. • Soldering iron stands to prevent accidental contact. • PAT tested. Check condition of cable. • Silicon rubber insulation on the lead to prevent melting. • Use of low voltage (24V or less) irons to prevent critical shock
Paper & die cutting machine	• Sharp edges on the work pieces. • Finger entrapment. • Exposed blades and creasing tools.	• Do not handle cut pieces on edges. • Only one person operating the machine at a time • Make sure protective release rubbers are in good condition and in place.
Food processor	• Cuts to fingers even when blades not rotating. • Always turn off power /isolate before removing bowl. • Cut or damaged plug cable. • Avoid using near water. • Correct assembly.	• Never put hands into bowl. • All processors should be fitted with a safety interlock to prevent operation • Always isolate/turn off at mains • PAT tested check condition of cable • Cleaning methods should not allow water into electrical parts. • All parts checked before use.

Sewing machine	• Handling & moving. • Electrocution -live contacts when changing light bulb. • Entanglement in machine. • Needle can pass through finger and nail. • Danger of tripping. • Broken needles	• Ensure carried to avoid lower back injury. Possibly use trolley. • Unplug the machine before carrying out maintenance. • Tie hair and clothing back. • QA correct training of use. Well lit working location • Site machine close to power outlet and avoid trailing leads. • Careful instruction in use.
Vacuum forming machine	• Finger traps on toggle clamps. • Handling hot plastic • Hot surfaces e.g. ceramic heating elements	• Keep fingers away from clamps. • PPE wear heat proof gloves. • Leave warning sign for hot surfaces –DO NOT TOUCH HOT! •
Laser cutter	• Harmful fumes/particles created • Fire- possible ignition of combustible materials. • Do not engrave or cut PVC based materials. • Do not cut reflective surfaces. • Risk of burns.	• Make sure extractor on. • Removal of small atomised/cut particles. • Air assist on • Ever leave the laser cutter unattended. Constant supervision. • Fumes are toxic if inhaled. • The laser beam can reflect off some materials resulting in damage to the laser. • Do not remove material parts from laser immediately in case hot.
Pillar drill	• When drilling dust and debris can get into your eyes. • Unless secured work might suddenly move and hit the operator. • Incorrect drill speed selected can cause smoke, fire and possibly lead to excessive drill wear or breakage.	• PPE- wear a face visor or goggles. • Always hold work securely e.g. use a machine vice or G clamp. • Select the correct speed for the drill being used and the material being worked.
Vertical belt	• Touching moving abrasive	• Keep fingers away from

sander	surface. - Sanded particles in eyes. - Dust and vapours being breathed in.	abrasive surface & always wait by machine until it has stopped moving. - PPE –goggles /visor - Extraction on/well ventilated room.
Ceramics oven	- Hot surfaces. - Risk of electrical shock	- Always use appropriate PPE (heatproof) gloves when handling hot ceramics. - PAT tested. Check condition of cables.

3	b	i	Any 3 visible safety features:	3	3 x 1
			- Chain guard - Stabilisers - Brakes - Grips on pedals or handle bars - Reflectors - Protective thick end pieces on handle grips		Wheel guard = 0 Wheel guard to stop stones hitting your back = 1 Chunky tyres / bigger grip = 0

3	b	ii	LED lighting or similar- see where you are going and so other persons can see you. Bike helmet – protect against head injury Knee & elbow pads- protect against falling. High visibility jackets- so other people can see you at night Additional reflectors on wheels- so other people can see you from the side Bell- to give audible sound to warn others of your proximity.	6	Must include examples to gain 5-6 marks. One word answers max of 3 marks Watch for features already on the bike. Second brake ok
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3	c	i	The BSI Kitemark/ British Standards Kitemark Accept Kitemark (key phrase)	1	
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3	c	ii	A symbol of <u>quality</u> and <u>safety</u> . <u>Assure the customer</u> that product is <u>consistently reliable</u> .	2	Any 2 points <i>Tested fit for use=1 Tested against standard= 2 = Safety & quality standard =2 Tried and tested for use = 2 Safe =0 Safe to use =1 Tested =1 Copyright =1 Quality product = 1</i>
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3	d	i	See table below:	1	Any correct act or piece of legislation named.
3	d	ii	See table below:	2	2 relevant points. 1 point with example = 2 marks <i>Can get 2 marks without naming a piece of legislation. IF it is about legislation and how it protects customers.</i>

The Trade Description Act 1968	Illegal to make false claims about a product. Not allowed to apply a false description.
The Consumer Protection Act 1987	Stops the sale of harmful or defective products. Meet certain requirements & uphold suitable levels of safety. Get money back.
The Sale of Goods Act	All goods should be fit for purpose and do the job for which they were intended. If goods are faulty you can claim from the retailer.
The Consumer Safety Act 1978	The government can ban the sale of dangerous products e.g. fireworks

	Minimise risk to consumer from potentially dangerous products.
The Weights & Measures Act	It is illegal to sell products that are under weight or sold in short measure.
The Food & Safety Act	Provides guidance on food hygiene management.
Food Safety Regulations	Provides guidance on food hygiene management.
Food Labelling Regulations	Certain information must be included on food labels by law.

Question	Part	Sub Part	Marking Guidance	Mark	Comments
4	a	i	Any suitable specific main material. e.g. MDF, acrylic, card, HIP sheet, felt, biscuit mix, pastry etc.	1	No marks for generic material groups e.g. wood, metal, plastic, food, textile or paper. Flour =1
4	a	ii	Good understanding of properties in relation to scale of production e.g. stock sizes, availability, ease of working. Vague reason or partially correct. No attempt/incorrect.	2	2 marks 1 mark 0 marks Not looking for suitability for customer. Not aesthetics
4	b		Layout and order of processes: Well planned and feasible layout, order of processes and/or instructions. No major omissions. Generally correct layout, but some errors in sequence. Some omissions. Only part of a layout and order given. Superficial notes and instructions. No evidence of a layout or order for manufacture. Identification of appropriate tools and equipment: N.B. Ruler = 1 Pencil = 0 4 or more appropriate tools or pieces of equipment identified for producing batch of 20.	5 4	4 -5 marks 3- 4 marks 1-2 marks 0 marks 4 marks

			3 tools or pieces of equipment identified mainly appropriate for producing a batch of 20 2 tools or pieces of equipment identified and appropriate. 1 tool or piece of equipment identified No tools or equipment identified. Quality of communication: High quality sketches, notes and diagrams. Use of colour and or tone. Sketches (flowchart) and notes with details of limited quality. Notes or sketches only. No attempt	3	3 marks 2 marks 1 mark 0 marks No marks for consumables e.g. sandpaper, wire wool No marks for safety equipment e.g. goggles. CAD or CAM = 0 3 marks 2 marks 1 mark 0 marks
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4	c		Templates: A shape made from a durable material which can be lined up and drawn/cut around to reproduce the original shape e.g. dress pattern, cake decoration, sheet metalwork, block pattern, pottery templates.	3	Accept: 3 valid points - or 2 valid points with an example. N.B. Accept stencils as a form of template
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4	c		Jigs: A device you line material up to	3	Accept: 3 valid points
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			accurately repeat an operation accurately time after time e.g. for sawing, cutting, drilling, punching.		or 2 valid points with an example. Think of lining up paper on a photocopier.
4	c		Moulds: A shaped cavity used in which a liquid can be poured until it solidifies or cools e.g. jelly making, aluminium casting, slip casting	3	Accept: 3 valid points or 2 valid points with an example.
4	c		Formers: A construction used to help with shaping operations e.g. laminating, vacuum forming, acrylic bending, felt blocking, dressmaker's dummy, drop moulding & drape forming in clay.	3	Accept: 3 valid points or 2 valid points with an example.
4	c		Dies: Used to produce a consistent cut out on paper, card, leather, plastics & foams. Can also be used for creating perforations on packaging, punching euro slots and creasing card for folding. Knife blades for cutting Rounded blades for creasing	3	Accept: 3 valid points or 2 valid points with an example. Ink dyes = 0 Pastry cutters = 1 Reference to extrusion e.g of plastic or piping bag =1

Question	Part	Sub Part	Marking Guidance	Mark	Comments
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5	a	i	Named design movement: Arts & Crafts movement Art Nouveau Art Deco Bauhaus Modernism De Stijl Memphis Post modernism NB check for other art movements if unsure e.g. pop art, atomic	1	1 mark for any recognised art movement.
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5	a	ii	Designers: Any named designer correctly identified with movement in 5a (i).	1	Check google or similar if unsure. Surname only = 1
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Design Movement	Designers
Arts & Crafts movement	William Morris
Art Nouveau	Charles Rennie Mackintosh Louis Comfort Tiffany Rene Lalique Henri Guimard Peter Behrens
Art Deco	Clarice Cliff Edgar Brandt Pierre Chareau William Van Alen Eileen Grey Alfonso & Renato Bialetti
Bauhaus	Walter Gropius Miles Van Der Rohe Marcel Breuer Karl J Jucker Wilhelm Wagenfeld Marianne Brant
Modernism	Ray Eames Carlo Mollino Raymond Loewy
De Stijl	Thoe van Doesburg Gerrit Rietveld

	JJP Oud Piet Mondrian
Memphis	Ettore Sottsass Alessandro Mendini Michael Graves Michele de Lucchi
Post Modernism	Michael Graves Philippe Starck Ron Arac
Pop Art	Andy Warhol Mary Quant Vivienne Westwood Roy Lichtenstein

5	b		Any two appropriate features.	2 x 2	Simple point = 1 mark Two points expressed for each feature. Point plus example = 2 marks.
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Design Movement	Features
Arts & Crafts movement	• Everyday items were made by craftspeople conforming to highest aesthetic standards. • Inspired by natural patterns and forms. • Fight against mass production and inferior quality products. • High quality materials used. • Products only available by the wealthy.
Art Nouveau	• Many elements of design drawn from nature e.g. plants, vines and leaves. • Organic forms • Used Japanese art & imagery.
Art Deco	• Used geometric forms. • Rich colours e.g. gold • Lavish design/ornamentation • Glamorous designs. • Inspired by artefacts from Tutankhamen's tomb
Bauhaus	• Form should follow function. Made extensive use of new materials e.g. steel piping, plywood and industrially made glass.

	• Products for the working masses rather than luxury goods.
Modernism	• Use of geometric shapes for ease of production. • Little decoration
De Stijl	• Coloured surfaces to emphasize construction e.g. Red & Blue chair. • Primary colours. • Use of vertical & horizontal lines/shapes. • Rejects use of nature in designs. • Aesthetic purity rejecting all decoration. • Abstract design
Memphis	• Use of decorative finishes to make products more aesthetically pleasing • Made use of modern materials e.g. plastic laminates. • Funky and novelty designs. • Move away from vertical and horizontal lines • Designing of products in a new distinctive way e.g. the Carlton Dresser.
Post Modernism	• Use of modern materials • Modern production methods • The streamlined age • Greyhound bus
Pop Art	• Bright bold colours/ electric colours. • Eye catching • Use of contrasts. • Imagery for popular culture e.g. Marilyn Monroe. • Campbell's soup can.

5	c	Retro design: • Increased range of features, functions and facilities • Not old fashioned products. • Use the latest safety standards. • 10-20 years old • Use latest materials • Use latest technology	9	7-9 marks Thorough understanding of retro design supported with several quality examples. Well-constructed
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			• Use latest production techniques and technologies e.g. DAB radio to look like L. Griffen's 1950 design. • Make a modern product look like one from past times. Examples: • Homeware with distinct patterns e.g. ceramics and wallpaper. • Electrical appliances e.g. DeLonghi toaster • Cars e.g. Chrysler PT cruiser, Mini • Fashion e.g. clothes and fabrics • American diner • PET coke bottle	sentences using good grammar. 4-6 marks Good understanding of retro design with 1 or 2 appropriate examples. Sentences may contain minor errors in spelling. 1-3 marks Basic understanding of retro design/ not understood the concept of retro design Very poor sentences/ grammar. Simple list/bullet points given. Very limited/no use of examples. 0 marks No attempt made or not answered the question.
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Question	Part	Sub Part	Marking Guidance	Mark	Comments
6	a	i	2D drawing technique: - Freehand sketches or sketching - Thick & thin line drawing 1st angle projection 3rd angle projection - Pie charts - Histograms - Sectional views - Flow diagrams - Venn diagrams - Nets 2D design 2d CorelDraw	1	Grid paper = 0 Squared paper = 0 Bold lines to make stand out = 1 Google sketch up or Creo = 0 Illustrator = 1 Indesign = 1 Photoshop = 1
6	a	ii	Detailed response with at least two point made and linked to how it would help share/communicate ideas with others 1 or 2 points made with limited reference to sharing ideas Brief /simple statement with no reference to sharing/communicating with others. No response/ incorrect response.	3 2 1 0	1 mark per point made.
6	b	i	3D drawing technique: - Isometric - Perspective - Oblique (cabinet& cavalier) - axonometric - Exploded - Crating - Shading/rendering	1	Isometric (paper) = 1 Prodesktop = 1 Creo =1 Google sketch up =1 Solidworks = 1 Art cam = 1
6	b	ii	Detailed response with at least two point made and linked to how it would help share/communicate ideas with others 1 or 2 points made with limited	3 2	1 mark per point made.

			reference to sharing ideas		
			Brief /simple statement with no reference to sharing/communicating with others.	1	
			No response/ incorrect response.	0	

6	c		Design: • CAD+ detail point/use • Power point presentation • e-mail • video conferencing • Named software packages e.g. Solid works, 2D design PCB wizard Manufacture: • CAM + detail point/use • Computer Integrated Manufacture -CIM • Numerical Control - NC	6	Any 6 points made or 3 points explained in detail. No marks for repeats e.g. 1 mark for named CAD software and 1 mark for named CAM equipment
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