



GCSE MARKING SCHEME

SUMMER 2016

**DESIGN & TECHNOLOGY: PRODUCT DESIGN
4141/01**

INTRODUCTION

This marking scheme was used by WJEC for the 2016 examination. It was finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conference was held shortly after the paper was taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conference, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about this marking scheme.

GCSE DESIGN & TECHNOLOGY: PRODUCT DESIGN

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SECTION A

					On paper	Question Totals	Overall TOTAL
1	(a)	(i)	<p>One word responses or any specification point that is not related to Function.</p> <p>Limited answer e.g. The buttons must be comfortable and easy to operate.</p> <p>Full answer should reflect a typical specification point and be related to Function e.g. The remote must be ergonomically designed with the buttons located in positions that are comfortable for the user to operate.</p> <p>Answers could include: Buttons easy to operate, control sky screen and menu easily through handset, ergonomic positioning of most frequently used controls, comfortable to the touch, good grip, good range for changing channels, programmable so it can be used with other devices.</p>	<p>0</p> <p>1</p> <p>2</p>	2		
		(ii)	<p>One word responses or any specification point that is not related to Target Market.</p> <p>Limited answer e.g. The remote must appeal to adults.</p> <p>Full answer should reflect a typical specification point and be related to Target Market e.g. The remote should be suitable for a wide range of users from children to adults as it is a product that is used by everyone.</p> <p>Answers could include: Appeal to wide range of users, suitable colour and design, should consider safety implications for children, not easily broken.</p>	<p>0</p> <p>1</p> <p>2</p>	2		

					On paper	Question Totals	Overall TOTAL
1	(a)	(iii)	<p>One word responses or any specification point that is not related to Aesthetics.</p> <p>Limited answer e.g. The remote must be attractive to look at.</p> <p>Full answer should reflect a typical specification point and be related to Aesthetics. e.g. The remote must have an attractive shape and modern colours so that it will not look out of place in a modern household.</p> <p>Answers could include: Attractive shape, suitable colour, fit in with other appliances, modern appearance, clear layout of buttons.</p>	0 1 2	2		
	(b)	(i)	<p>No answer or the answer is not related to the materials used.</p> <p>A basic answer with reference to one material e.g. ABS is used for the casing because it is hard wearing.</p> <p>A basic answer with reference to two materials or a detailed answer about one. e.g. ABS is used for the casing because it is hard wearing and durable and if it is dropped it is less likely to break.</p> <p>A detailed answer discussing both materials with clarification. e.g. ABS is used for the casing because it is hard wearing and durable and if it is dropped it is less likely to break. Rubber is used for the buttons as it is soft and flexible making it comfortable to touch for the user.</p> <p>ABS Case – hard wearing, tough, can be moulded, range of colours, finish. Rubber Buttons/covering – grippy material, does not slide, durable, soft to touch, comfortable mouldable.</p>	0 1 2 3	3		
		(ii)	<p>No answer or the answer does not give a reason that is appropriate.</p> <p>A simple answer with reference to: e.g. human factors, easy to use, comfortable.</p> <p>An elaborated answer e.g. Designing products that fit the human body. The buttons must be easy to use.</p> <p>A detailed answer that explains e.g. When designing the remote, anthropometric data would have been considered to ensure it is comfortable for the user to hold and operate. The buttons have been placed in positions that are easily accessible to the user when using the product.</p>	0 1 2 3	3		

					On paper	Question Totals	Overall TOTAL
1	(c)	(i)	No answer or the answer does not give a reason that is appropriate. Shipping	0 1	1		
		(ii)	No answer or an answer that does not state £39,986 Answer that is £39,986 but no calculation OR correct workings but incorrect answer. Answer that is £39,986 and has all correct workings. 10,000 x £24.99 = £249,900 14% of £249,900 = £34,986 OR (249900 / 100) x 14 = £34,986	0 1 2	2		
						15	15

					On paper	Question Totals	Overall TOTAL
2	(a)	(i)	REUSE RETHINK REPAIR	1 1 1	3		
		(ii)	No answer or inappropriate answer.	0	3		
			A simple answer e.g. The amount of material used on the product should be reduced.	1			
			An elaborated answer e.g. The amount of material used on the product should be reduced in order to preserve the limited resources we have.	2			
			A detailed answer that explains e.g. Materials should be sourced locally to reduce transport costs and emissions. Designer should reduce the amount of material used on the product and the packaging to preserve resources and reduce carbon emissions.	3			
			Answers could be based on: <ul style="list-style-type: none"> • Source local materials to reduce transportation cost. • Reduce the amount of material used on the product. • Reduce the amount of energy needed to manufacture the product. • Reduce the amount of packaging used. • Reduce carbon emissions by transporting materials straight to the retailers rather than via warehouses. 				
	(b)		No answer or inappropriate answer.	0	4		
			A simple answer that is unexplained e.g. To analyse the life of a product.	1			
			An answer that shows some understanding and description. e.g. Analyse the environmental impact of a product and how we can make it less by changing parts of its production. Could include a partially explained LCA.	2			
			A full answer that explains and shows understanding. e.g. Could mention cradle to grave, where the materials come from and how the product is disposed of. Should include a fully explained LCA.	3-4			

					On paper	Question Totals	Overall TOTAL
2	(b)	<p>Life cycle assessment is the most reliable method to verify environmental impacts of products. It provides designers, regulators and engineers with valuable information for exploring decisions in each life stage of materials, buildings, services and infrastructure. LCA identifies environmental hot spots in products and materials and establishes the benchmark against which improvements can be measured. LCA is also used in new product research and development, when environmental footprint is important to the future marketing or cost structure of a product. The benefit to LCA is simple: reliable, transparent data for both manufacturers and consumers, enabling better decisions.</p> <p>It is important to think of LCA because products need to be recycled and reused after use. This will help cut down on unnecessary use of raw materials, processing of raw materials involving wasted time and energy, transportation costs. After the product is finished with it can either be reused or recycled due to careful thought/design at the start.</p> <ul style="list-style-type: none"> • Raw material acquisition-choose different material or less. • Processing-ensure miners/farmers get fair wages. • Transporting-reduce unnecessary transportation energy. • Using-impact during use. • Disposal/product (material)-could it be disposed of differently. • Carbon footprint. 					
						10	25

				On paper	Question Totals	Overall TOTAL
3	(a)	Designer 1 – James Dyson Designer 2 – Philippe Starck	1 1	2		
	(b)	No answer or no relevant issues described or discussed - see fact sheet on designers.	0	8		
		Some description of the work of the chosen designer. Little understanding of its main features. A little understanding of the impact on the design industry is described. Quality of Written Communication is basic, presenting occasionally appropriate material with some coherence, some errors of grammar, punctuation and spelling.	1 or 2			
		Description of the work of the chosen designer. Some understanding of its main features. Some understanding of the impact on the design industry. Quality of Written Communication is good, presenting mainly appropriate material in a coherent manner, few errors of grammar, punctuation and spelling.	3 or 4			
		Description of the work of the chosen designer. Understanding shown of its main features. Discussion of the impact on the industry with some appropriate examples provided. Quality of Written Communication is very good, presenting appropriate material in a coherent and logical manner, very few errors of grammar, punctuation and spelling.	5 or 6			
		Description of the work of the chosen designer. Clear understanding shown of its main features. Discussion of the impact on the industry with fully appropriate examples provided. Quality of Written Communication is excellent, presenting wholly appropriate material in a coherent and logical manner, hardly any errors of grammar, punctuation and spelling.	7 or 8			
					10	35

James Dyson:

Work:

- Known for his Vacuum Cleaner designs, Wheelbarrow and Sea Truck.
- The cyclonic action leads to the bag less vacuum cleaner.
- Still a designer today the Airblade his latest concept.
- One of his first designers to use the ball as a form of wheel.

Main Features:

- Unique products in the market place today; transparent and bright coloured plastic a trade mark of his work.
- Product's 'technology/engineering' is not hidden from user.
- Not afraid to develop an existing/traditional idea or product and look at it from a different angle.

Influence:

- Started in the U.K., set up his own business to start off. (Self-belief)
- Took on the big corporate companies and won.
- The idea is as important as technology. The concept of the ball as an idea used in the vacuum cleaner Dyson Ball.

Philippe Starck:

- Starck works independently as a designer – works in collaboration with a number of firms.
- Extensive range of products: Everyday items, furniture, lemon juicer, interiors, vehicles, yachts, hotels, turbines.
- Iconic design – Sleek lemon juicer 'Juicy Salif' – become an affordable cult item
- Pushes the limits of contemporary design.
- Creative and imaginative designs – Bold, stand out, flamboyant.
- Uses metallic finishes.
- High gloss finishes.
- Use of transparent materials.
- Form of his products were often inspired by natural and everyday objects.
- Organised elegantly and rigorously.
- Believes creation must improve the lives of as many people as possible.
- Ecological implications very important to him – 'The green'.

					On paper	Question Totals	Overall TOTAL
4	(a)		Specification Development Planning	1 1 1	3		
	(b)	(i)	<p>No answer or the answer does not give a reason that is appropriate. A simple answer can be awarded 1 mark. e.g.: Detailed research will give the designer enough information to make a successful product.</p> <p>An elaborated answer that explains can be awarded 2 marks. e.g.: Detailed research will give the designer all the relevant information needed to make a successful product and it could also identify possible issues which could affect the product.</p> <p>Detailed research will ensure the designer has all the relevant/necessary information needed to make a successful product; the designer will be made aware of any potential issues which could affect the product and avoid similar mistakes found in other products; helps the designer focus on what are the most important factors to consider; aware of what the client/target market requires.</p>	0 1 2	2		
		(ii)	<p>No answer or the answer does not give a reason that is appropriate. A simple answer can be awarded 1 mark. e.g. To find out the views of those who will be using the product.</p> <p>An elaborated answer that explains can be awarded 2 marks. e.g. User trials allow the designer to find out what the user thinks about the product and it helps the designer to identify potential problems or improvements that can then be made to the product.</p>	0 1 2	2		

					On paper	Question Totals	Overall TOTAL
4	(c)	(i)	No design for the bottle presented or inappropriate design.	0	4		
			A simple design presented for the bottle, lacks innovation, no mention of ergonomics.	1			
			A suitable design for the bottle presented with some reference to ergonomics but lacking detail.	2			
			A good design for the bottle with some innovation with regards to shape/function, consideration of ergonomics is clear.	3			
			An innovative design for the bottle with respect to shape/function, detailed consideration of ergonomics is clear.	4			
		(ii)	No attempt at creating a lid for the bottle.	0	3		
			A simple attempt at creating a lid. Not innovative. Poor communication/ no colour.	1			
			A suitable lid has been designed with some attention to aesthetic detailing and presented with colour and annotation.	2			
			A detailed, innovative and aesthetically pleasing design for the lid presented to a high standard with colour and annotations.	3			
		(iii)	No design for the POS presented or inappropriate design.	0	4		
			A simple design presented for the POS, lacks innovation, no real thought about how the bottle will be displayed.	1			
			A suitable design for the POS presented with some reference to how the bottle will be displayed and enhanced, but lacking detail.	2			
			A good design for the POS with some innovation with regards to shape/function, clear to see how the bottle will be displayed and enhanced.	3			
			An innovative design for the POS with respect to shape/function, detailed consideration of how the bottle will be displayed and enhanced.	4			

					On paper	Question Totals	Overall TOTAL
4	(c)	(iv)	<p>Sizes must be presented and be appropriate to design</p> <p>Appropriate Materials must be stated for the manufacture of the bottle and POS.</p> <p>Appropriate Processes must be stated for the manufacture of the bottle and POS.</p>	1	3		
		(v)	<p>No answer or the answer cannot be understood, no annotation.</p> <p>Poor quality graphic skills, hard to understand, annotation unclear.</p> <p>Graphic skills are adequate, understandable, limited annotation of important details.</p> <p>Good graphic details and image, appropriate styling, understandable, good annotation of important details.</p> <p>Excellent graphic details and image, highly appropriate styling, with correct annotation of important details and techniques.</p>	0	4		
						25	60

SECTION B

				On paper	Question Totals	Overall TOTAL
5	(a)	Cleaning Chemicals – Continuous Flow Sports Shoes - Batch Concept Smartphone – One Off	1 1 1	3		
	(b)	No answer or an answer that is inappropriate. A simple answer can be awarded 1 mark. It saves the manufacturer money. An elaborated answer that explains can be awarded 2 marks. The manufacturer saves on production costs as the product does not need to be assembled. Answers could be based on: <ul style="list-style-type: none"> • Save on production costs as no assembly needed. • Less storage space needed in the warehouse. • Products are easy to store as they are boxed up. • More products can be transported at a time saving on transportation costs/ reduced carbon footprint. 	0 1 2	2		
	(c)	No answer or an answer that is inappropriate. A simple answer can be awarded 1 mark. Flat packed products are cheaper to buy An elaborated answer that explains can be awarded 2 marks. Flat packed products are generally cheaper to purchase than assembled products as the manufacturer can pass on some of the savings they have made by not assembling the product. Answers could be based on: <ul style="list-style-type: none"> • Cheaper products as they have not been assembled. • Easy to transport home in car etc... • Easier to move product into desired location before assembly. 	0 1 2	2		

				On paper	Question Totals	Overall TOTAL
5	(d)	<p>No answer or inappropriate answer.</p> <p>A simple answer can be awarded 1 mark. QC when you check parts or QA is when you check the processes needed.</p> <p>An elaborated answer that explains either QA or QC in detail or both in less detail can be awarded 2 marks. QC is when you check parts or QA is when you check the processes needed. Mention both award 2 marks.</p> <p>A detailed answer that explains both QA and QC in detail can be awarded 3 marks. Quality control is when you carry out checks during the manufacturing process at different stages and QA is when you have checked the processes needed to make the part.</p> <p>QC - Check that all components function effectively so that all products meet the required standards.</p> <p>Quality Control Checks Test a random sample to see if everything fits. Is the correct size and shape. Correct colour. Material checks before manufacture begins. Quality of finish. Mechanical checks (moving parts).</p> <p>Quality Assurance checks all the systems on the production line meet the required standards in order to ensure the final product is manufactured to the highest standard.</p>	0 1 2 3	3		
					10	10

					On paper	Question Totals	Overall TOTAL
6	(a)	(i)	Chocolate Tray - PET Thermoplastic Helmet Visor - Photochromic Smart Material Skateboard - Ply board Manufactured Board	1+1 1+1 1+1	6		
		(ii)	No answer or the answer does not give a reason that is appropriate. A simple answer can be awarded 1 mark. An elaborated answer that explains can be awarded 2 marks. A detailed answer that explains can be awarded 3 marks. <i>1 mark for each point mentioned up to 3 marks.</i> Reponses should relate to: <ul style="list-style-type: none"> • Strong • Hard Wearing; • Flexible; • Durable; • Weather resistant when treated. Hard = 0, Tough = 0	0 1 2 3	3		
	(b)		No answer or the answer does not give an explanation that is appropriate. A simple answer can be awarded 1 mark. A Material that cannot be made again. An elaborated answer that explains can be awarded 2 marks. A non-renewable material comes from a finite source that cannot be created again for example plastic is a non-renewable material as it is made from oil which we will eventually run out of.	0 1 2	2		
	(c)		No answer or the answer does not give a reason that is appropriate. A simple answer – an assertion – can be awarded 1 mark. An elaborated answer that explains can be awarded 2 marks. Package B is only made from cardboard which is a renewable material that is also very easy to recycle. It is therefore much more environmentally friendly. Package B will be much cheaper for the manufacturer as only cardboard is used which is a relatively cheap material <ul style="list-style-type: none"> • No plastic used which is non-renewable and expensive • Less energy used in manufacturing • Quicker to manufacture • Less waste material to recycle 	2 2	4		
						15	25

					On paper	Question Totals	Overall TOTAL
7	(a)		Countersink Bit Spanner Stanley Knife Allen Key	1 1 1 1	4		
	(b)		No answer or the answer does not give an appropriate explanation. Flammable material This material or substance must be kept away from naked flames or other heat sources to prevent to risk of fire. Safety Goggle must be worn To ensure that you do not get any flying debris or dust in your eyes causing injury.	0 1 1 1 1	4		
	(c)	(i)	No answer or the answer does not give a reason that is appropriate. A simple answer can be awarded 1 mark. An elaborated answer that explains can be awarded 2 marks. <ul style="list-style-type: none"> • Wear safety goggles. • Wear a face mask/ dust mask. • Ensure the area that you are spraying in is well ventilated. • Use a spray booth if possible. • Ensure the area is masked off to avoid overspray. 	0 1 2	2		
		(ii)	No answer or the answer does not state the correct procedure. 1 mark awarded for each stage of the process that is explained, up to a maximum of 4 marks. <ul style="list-style-type: none"> • Sand down the MDF until a very smooth finish is achieved (sander/glass paper) - • Use different grades of glass paper from coarse to fine to improve finish. • Clean off any dust or debris from the surface of the MDF to stop dust or debris being painted. • Seal the MDF using MDF sealer/PVA mixture/Cellulose sealant. Apply 3-4 coats with a light sanding in between each. • Apply 3-4 coats of primer with a light sanding after each layer until very smooth surface is achieved. • Apply final spray paint finish – 3+ coats required until solid/consistent colour is achieved. 	0 1 1 1 1	4		

				On paper	Question Totals	Overall TOTAL
	(d)	<p>No answer or the answer does not give a reason that is appropriate. 1 mark awarded for each stage of the process that is explained, up to a maximum of 5 marks.</p> <ul style="list-style-type: none"> • Draw the design for the moulded shape on a 2D CAD package (2D Design) • Ensure that you include an inlet in the mould for the Pewter • Cut the mould out of MDF (or other suitable material) using the Laser cutter or CAMM 2 • Sandwich the mould in between two outer layers and clamp together securely. • Heat up Pewter in a crucible using a Kiln/burner or casting unit. • Pour Pewter into the mould and allow time for cooling. • Remove moulded shape from the mould. <p>Graphic Communication</p> <ul style="list-style-type: none"> • Very basic attempt and lacking in a majority of detail. • Adequate attempt to illustrate the process. <p>A maximum of 5 marks can be achieved if there are no sketches.</p>	<p>0</p> <p>1 1 1 1</p> <p>0 1</p>	6		
					20	45

					On paper	Question Totals	Overall TOTAL
8	(a)		Laser Cutter – CAM Drawing Program – CAD Spreadsheet - ICT	1 1 1	3		
	(b)	(i)	<i>No answer or the answer does not give an appropriate CAD package. A name of any CAD software that can be linked:- 2D Design Corel Draw Illustrator Prodesktop Creo Pro Artcam Boxford, Denford miller software. Solid Works Spaceclaim</i>	0 1	1		
		(ii)	Black – Cut through. Red – Engrave an enclosed area. Green – Kiss Cut / Engrave single line.	1 1 1	3		
		(iii)	<i>No answer or the answer does not give a reason that is appropriate. A simple answer can be awarded 1 mark. An elaborated answer that explains can be awarded 2 marks. e.g.</i> <ul style="list-style-type: none"> • Need to allow for the thickness of the laser beam (approx. 0.6mm). • On the slot reduce the length and width by 0.6mm to ensure a tight fit. • You can use the contour tool to do this quickly and effectively. 	0 1 2	2		
		(iv)	<i>No answer or the answer does not give a reason that is appropriate. A simple answer – an assertion – can be awarded 1 mark. An elaborated answer that explains can be awarded 2 marks. A detailed answer that explains can be awarded 3 marks.</i> <ul style="list-style-type: none"> • The trophy can be duplicated as many times as needed by simply altering the award and name. • Much quicker manufacturing time compared to if they were made by hand. • Self-finishing process – high quality finish on the edges of the acrylic. • Highly accurate process – all trophies will be identical. 	0 1 2 3	3		

					On paper	Question Totals	Overall TOTAL
8	(c)	<p><i>No answer or the answer does not give a reason that is appropriate.</i> <i>A simple answer can be awarded 1 mark.</i> It produces 3D models quickly.</p> <p><i>An elaborated answer that explains can be awarded 2 marks.</i> Produces detailed and sophisticated models of virtually any shape from a 3D computer model.</p> <p><i>A detailed answer that explains can be awarded 3 marks.</i> 3D Rapid Prototyping produces detailed and sophisticated models of virtually any shape from a 3D computer model. Models are produced quickly and they are ready for testing. Changes can be made easily to the design and further prototypes created.</p> <ul style="list-style-type: none"> - Produces detailed and sophisticated models of virtually any shape from a 3D computer model. - Much quicker than modelling by hand or using other CAM processes. - Model is completed ready for finishing. - The model can be tested in its intended form. - Changes can be made quickly to aid development. - The virtual and physical models are almost identical. 	0 1	3			
			2				
			3				
						15	60