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# **GCSE MARKING SCHEME**

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**SUMMER 2016**

**DESIGN & TECHNOLOGY  
RESISTANT MATERIALS TECHNOLOGY  
4111/01**

## **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 - RESISTANT MATERIALS TECHNOLOGY**

**SUMMER 2016 MARK SCHEME**

Resistant Materials Technology - MARK SCHEME 2016 – **POST QPEC VERSION – 09/11/14**

Question				On paper	Question Totals	Overall TOTAL
1	a	i	<i>No explanation or incorrect explanation.</i>	0	3x2.	6
			<p>Aesthetic:</p> <p>Appropriate explanation but lacking detail                      AWARD 1 mark E.g. Finished in primary colours.</p> <p>Appropriate explanation well detailed                              AWARD 2 marks E.g. Finished in primary colours which create a bright, cheery school environment.</p> <p><b>Answers related to:</b> Textures are smooth.</p>	1 or 2		
		ii	<i>No explanation or incorrect explanation.</i>	0		
			<p>Function:</p> <p>Appropriate explanation but lacking detail.                      AWARD 1 mark E.g. The coat rack is a suitable size for primary school children.</p> <p>Appropriate explanation well detailed.                              AWARD 2 marks E.g. Anthropometric data has been used to ensure that the coat rack is a suitable size for primary school children.</p> <p><b>Answers related to:</b> There are castors on the coat rack so it can be moved. Colour coated hooks help children to remember location of coats/bags.</p>	1 or 2		
		iii	<i>No explanation or incorrect explanation.</i>			
			<p>Safety considerations:</p> <p>Appropriate explanation but lacking detail                      AWARD 1 mark E.g. The coat rack has a wide base.</p> <p>Appropriate explanation well detailed                              AWARD 2 marks E.g. The wide base of coat rack improves its balance so it will not topple over easily.</p> <p><b>Answers related to:</b> No sharp edges. Steel is a durable material so it can hold lots of bags and coats. Sturdy construction of coat rack. Locks on castors – rack can be held in place, lessen danger of falling over if pushed.</p>	1 or 2		

Question				On paper	Question Totals	Overall TOTAL
	b	No answer or incorrect answer		0	3	9
		Appropriate explanation but lacking detail. AWARD 1 mark E.g. Costs less for the manufacturer.		1		
		Appropriate explanation, includes some detail AWARD 2 marks. E.g. Quicker production time means that it is cheaper for the manufacturer.		or 2 or 3		
		Appropriate explanation, well detailed AWARD 3 marks. E.g. Quicker production time and reduced transport costs leads to a higher profit margin for the manufacturer.				
		<b>Also advantages related to:</b> <i>Consistent shape of flatpacked products means that space is saved during transport -more cost effective.</i> <i>Assembly of products is a labour intensive, high cost part of production process.</i> <i>More products can be transported in one journey. Less storage space required - manufacturer can stock more of the product in the same space as assembled versions.</i>				
	c	i	No answer or incorrect answer. 17 at £110 = £1870	0	1	10
		ii	No answer or answers that do not match the mark scheme.	0	2	12
			Answer that is 12% without workings – can be awarded 1 mark.  110/125 x100 = 88% 100-88 = 12%	1 or 2		
	d	No explanation or incorrect explanation.		0	3	15
		Appropriate explanation but lacking detail AWARD 1 mark E.g. The manufacturer can save money by buying materials in bulk.		1		
		Appropriate explanation, includes some detail AWARD 2 marks. E.g. The manufacturer can save money on materials by buying in bulk then passing then passing some of the saving onto the customer.		or 2 or 3		
		Appropriate explanation, well detailed AWARD 3 marks. E.g. Economy of scale means that the manufacturer can save money on materials by buying in bulk then passing then passing some of the saving onto the customer by reducing the unit cost.				
		<b>Answers related to:</b> Attractive to the manufacturer – less profit per unit but more profit overall if multiple products are bought. Manufacturing considerations – production is more efficient if a longer run of manufacturing is made. Production line can be set up – jigs, fixtures etc. Incentive for the customer to buy in quantity rather than single unit.				
					15	15

Question				On paper	Question Totals	Overall TOTAL
2	a	<i>No answer or an incorrect answer.</i>	0	3	3	18
		Only acceptable answers: Reduce or Rethink Reuse Recycle	3x1			
		<hr/>				
	b	<i>No answer or an inappropriate answer.</i>	0	4	7	22
		Candidates need to state two appropriate advantages such as:  Appropriate advantage but lacking detail.                      AWARD 1 mark E.g. Causes less pollution. Appropriate explanation with detail.                                      AWARD 2 marks E.g. Causes less pollution as the products will not decompose naturally in landfill.  <b>Also consider:</b>  Existing natural resources of oil and metal will be preserved. Energy is saved by recycling instead of producing new materials. Environmental concerns of producing more and more new products. Less carbon produced in recycling compared to making new.	2x2			
		<hr/>				
	c	<i>No answer or an inappropriate answer.</i>	0	3	10	25
		Appropriate explanation but lacking detail.                      AWARD 1 mark E.g. A LCA is used to measure a products impact on the environment. Appropriate explanation, includes some detail.                      AWARD 2 marks E.g. A LCA is used to measure a products impact on the environment at all stages of its life cycle, from raw material to disposal. Appropriate explanation, well detailed.                                      AWARD 3 marks E.g. A LCA is used to measure a products impact on the environment at all stages of its life cycle, from raw material to disposal. It can be used to improve the products sustainability.  Used to analyse at which stage the product causes most harm to environment.  Product can be improved and redesigned as a result of LCA.  'Cradle to grave' study.	1 or 2 or 3			
		<hr/>				
					<b>10</b>	<b>25</b>

Question				On paper	Question Totals	Overall TOTAL
3	a	<i>No answer or incorrect answer.</i>	0	2	2	27
		LEFT - GRAY      RIGHT - STARCK	2x1			
		<hr/>				
	b	<p>Candidates would need to include references to the following in their answers.</p> <p><b>Phillip Starck - range of work:</b></p> <ul style="list-style-type: none"> <li>• There are few areas of design he hasn't explored: from furniture to mail-order homes, motorbikes to mega-yachts, and even artistic direction for space-travel projects, to name but a few.</li> <li>• Responsible for the creation of a wide variety of objects in the O.W.O. Series, noodles for Panzani, boats for Beneteau, mineral-water bottles for Glacier, kitchen appliances for Alessi, toothbrushes for Fluocaril, luggage for Vuitton, "Urban Fittings" for Decaux, office furniture for Vitra, as well as vehicles, computers, doorknobs, spectacle frames, etc.</li> </ul> <p><b>Phillip Starck - ideas:</b></p> <ul style="list-style-type: none"> <li>• Much of his work produced in the 1980's and 1990's was influenced by fashion and novelty. It has even been referred to by some as being 'overdesigned'.</li> <li>• Philippe Starck believed in the <b>green</b> long before ecology became fashionable, out of respect for the planet's future.</li> <li>• Concept of "<b>democratic design</b>" – increase the quality of objects at lower prices so that more people can enjoy the best – he was a lone voice at a time when design was turned exclusively towards an elite.</li> </ul> <p><b>Bethan Gray - range of work:</b></p> <ul style="list-style-type: none"> <li>• After leaving college she became Design director at Habitat producing furniture collections including the Parker and Hana ranges.</li> <li>• Pimlico kitchen range won an Elle Decoration award.</li> <li>• Set up her own design studio in 2008 - Bespoke furniture designer for companies such as John Lewis, Harrods and Liberty.</li> </ul> <p><b>Bethan Gray - ideas:</b></p> <ul style="list-style-type: none"> <li>• Inspiration often comes from natural materials such as wood, marble, leather and slate.</li> <li>• Believes in using the best quality materials and working closely with closely with craftspeople.</li> <li>• Combines natural techniques with cutting edge manufacturing Technology.</li> <li>• Inspired by the everyday items that surround us all, to objects and buildings discovered whilst travelling the globe.</li> <li>• Work reflects traditional Welsh culture and craft as well as to the geometric patterns and form</li> </ul>		8	10	35
		No answer or no relevant issues described or discussed. Note- if both designers are described. Mark the first answer only.	0			
		Simple description of the range of work of one designer. Little, if any, understanding of the ideas on product design. Quality of Written Communication is limited, presenting material with limited coherence, many errors of grammar, punctuation and spelling.	1 or 2			
		Some description of the range of work of one designer. Little understanding of the ideas on product design. Quality of Written Communication is basic, presenting occasionally appropriate material with some coherence, some errors of grammar, punctuation and spelling.	3 or 4			
		Description of the range of work of one designer. Some understanding of the ideas on product design. Quality of Written Communication is good, presenting mainly appropriate material in a coherent manner, few errors of grammar, punctuation and spelling.	5 or 6			
		Clear description of the range of work of one designer. Clear understanding of the ideas on product design. 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

Question				On paper	Question Totals	Overall TOTAL
4	a		<i>No answers or an incorrect answer.</i>	0	3	38
			Only acceptable answers: <b>1. Research/Investigation/Analysis</b> <b>4. Initial Ideas</b> <b>7. Planning</b>	3x1		
			<hr/>			
	b		<i>No answer or an inappropriate answer.</i>	0	2	40
			Appropriate explanation but lacking detail. AWARD 1 mark E.g. The material has to be suitable for its end purpose. Appropriate explanation well detailed. AWARD 2 marks E.g. The material has to be suitable for the product it is intended in terms of its appearance and durability. <b>Answers related to:</b> Comparing the properties of a range of materials. Carrying out Safety tests to ensure the materials will be strong enough/ inflammable/flexible etc. Comparing the Aesthetic appearance of materials. Testing to ensure materials match the requirements of the specification	1 or 2		
			<hr/>			
	c		<i>No answer or an inappropriate answer.</i>	0	2	42
			Appropriate explanation but lacking detail. AWARD 1 mark E.g. Gives the designer a checklist to test the final product against. Appropriate explanation well detailed. AWARD 2 marks E.g. Gives the designer a checklist of measurable criteria that makes testing the final product more effective. <b>Answers related to:</b> The brief and Specification gives detailed information to guide a designer when evaluating. The brief and Specification are used to help generate, test and evaluate the finished product.	1 or 2		
	d	i	<b>Details to satisfy specification</b> <b>0 marks</b> no work or does not meet specification in anyway. <b>1 mark</b> Basic solution that addresses 1 or 2 specification points. <b>2 marks</b> feasible solution that addresses most of the specification points (3 specification points). <b>3 marks</b> feasible solution that addresses all of the 4 specification points.	0  1  2  3	3	45
			<hr/>			
		ii	<b>Technical details</b> <b>0 mark</b> no details of construction shown. <b>1-2 marks</b> basic solution but could work with few technical features and processes shown. <b>3-4 marks</b> feasible solution that shows some important technical features and processes. <b>5-6 marks</b> feasible solution, sufficient technical details are listed to manufacture the hurdle. Clearly communicated with detailed range of sketches and good annotation.	0 1 Or 2 Or 3 Or 4 Or 5 Or 6	6	51

Question				On paper	Question Totals	Overall TOTAL	
			<hr/>				
		iii	<b>Labelling suitable materials, components &amp; processes</b> Up to 3 marks for naming SPECIFIC and relevant material/s, component/s & process/es. <i>Do not accept wood, plastic etc.</i>	1 or 2 or 3	3	19	54
			<hr/>				
		iv	<b>Stating 2 important dimensions</b> Up to 2 marks specifying appropriate dimensions. 1 mark per important/appropriate dimension.	1 or 2	2	21	56
			<hr/>				
		v	<b>Quality of communication</b> 4 Excellent 3 Good 2 Average 1 Below average	1 or 2 or 3 or 4	4	25	60
						<b>25</b>	<b>60</b>



Question				On paper	Question Totals	Overall TOTAL
5	a	<i>No answers or an incorrect answer.</i>	0	4	4	64
		Only acceptable answers: <b>Blow moulding</b> <b>Vacuum forming</b> <b>Extrusion moulding</b> <b>Rotational moulding</b>	4x1			
		<hr/>				
	b	<i>No answer or an inappropriate answer.</i>	0	2	6	66
		Appropriate explanation but lacking detail.                      AWARD 1 mark E.g. Systems that make sure the product is made to a high quality. Appropriate explanation well detailed.                      AWARD 2 marks E.g. Systems and processes are in place at all stages of manufacture to ensure the product is made to the required standard.  <b>Answers related to:</b> Ensure that raw materials, manufacturing and staff training are of the highest quality.  Quality Assurance ensures that the product is 'fit for purpose'.  High quality products are produced, retaining the manufacturers credibility and customer confidence.  If the product meets the highest quality standard it is awarded with the ISO 9000 standard (International Standard of Quality).	1 or 2			
		<hr/>				
	c	<i>No answer or an inappropriate answer.</i>	0	4	10	70
		Marks awarded for discussing relevant factors such as:  <ul style="list-style-type: none"> <li>• Veneers are cut out to shape.</li> <li>• Glue applied between layers of veneer.</li> <li>• Former produced to shape of table.</li> <li>• Glued layers of veneer are clamped around the former.</li> <li>• Glued product is left to dry.</li> </ul> 1 mark – very basic understanding (1 of the above points referenced).  2 marks – some detail and understanding related to tools, processes (2 of the above points referenced).  3 marks - more detail and understanding related to tools, processes (3-4 of the above points referenced).  4 marks – detailed understanding (all of above points referenced),clearly communicated.  <b>Note</b> - Answers referring to the use of Vacuum formers/bag presses are also acceptable.	1 or 2 or 3 or 4			
					<b>10</b>	<b>70</b>

Question				On paper	Question Totals	Section TOTAL
6	a		<i>No answer or an incorrect answer.</i>	0	3	73
			Only acceptable answers: <b>Self-tapping screw</b> <b>Pop rivet</b> <b>Magnetic catch</b>			
			<hr/>			
	b	i	<i>No answer or an incorrect answer.</i>	0	3	76
			Only acceptable answers: (i) <b>Kevlar</b> (ii) <b>Carbon</b> (iii) <b>Tungsten</b>			
			<hr/>			
	c	(i)	<i>No answer or an incorrect answer.</i>	0	2	78
			Ductility Appropriate explanation but lacking detail. AWARD 1 mark E.g. The ability to be stretched. Appropriate description well detailed. AWARD 2 marks E.g. The ability to be stretched like a wire without breaking. <b>Answers related to:</b> Material's ability to deform under tensile stress. Property of a material that does not break or shatter when receiving a blow or under a sudden shock.	1 or 2		
		ii	<i>No answer or an incorrect answer.</i>	0	2	80
			Toughness Appropriate description but lacking detail. AWARD 1 mark E.g. How well a material can withstand forces without breaking. Appropriate description well detailed. AWARD 2 marks E.g. The measurement of a material's resistance to break or fracture. <b>Answers related to:</b> How well a material can withstand shocks such as hammering. The opposite to brittle. Absorb energy and plastically deform without breaking.	1 or 2		
			<hr/>			
	d	(i)	<i>No answer or an incorrect answer.</i>	0	2	82
			Candidates need to give two appropriate advantages such as: Manufactured boards are wider than planks of solid timber. Manufactured boards are very consistent less surface imperfections. Manufactured boards can be less expensive. Less joining is required. Appropriate discussion well. Sustainability – waste material can be used in some manufactured boards. Manufactured boards are more stable – less liable to warp, bend, bow etc.	2x1		
			<hr/>			

Question				On paper	Question Totals	Section TOTAL	
	(d)	(ii)	<i>No explanation or inappropriate explanation.</i>	0	3	15	85
			<p>Appropriate explanation but lacking detail. AWARD 1 mark E.g. MDF is made from wood dust and glue.</p> <p>Appropriate explanation, includes some detail. AWARD 2 marks E.g. MDF is made by breaking down wood into wood fibres then combining it with synthetic resin.</p> <p>Appropriate explanation, well detailed. AWARD 3 marks E.g. MDF is made by breaking down wood into wood fibres then combining it with synthetic resin and then forming it into sheets under pressure and heat.</p> <p><b>Also advantages related to:</b>            Breaking down hardwood or softwoods in a defibrator.            Combining wood pulp with wax and a resin binder.            Various thicknesses can be produced.            Panels sanded to achieve a smooth finish then trimmed to size.            Recycled materials such as newspapers, paper bags and boxes can be used.</p>	1 or 2 or 3			
						<b>15</b>	<b>85</b>

Question				On paper	Question Totals	Overall TOTAL														
7	a	No answer or an incorrect answer.		0	6	91														
		<table border="1"> <thead> <tr> <th>Name</th> <th>Use</th> </tr> </thead> <tbody> <tr> <td>Tenon Saw</td> <td>To make straight accurate cuts in wood.</td> </tr> <tr> <td>Handsaw</td> <td>To make cuts in solid timber and manufactured board</td> </tr> <tr> <td>Surform File</td> <td>To remove waste material rapidly from wood.</td> </tr> </tbody> </table>	Name	Use	Tenon Saw	To make straight accurate cuts in wood.	Handsaw	To make cuts in solid timber and manufactured board	Surform File	To remove waste material rapidly from wood.	6 x 1									
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		<p>Marks awarded for explaining suitable Risks <u>and</u> relevant Precautions such as:</p> <table border="1"> <thead> <tr> <th>Risk</th> <th>Precaution</th> </tr> </thead> <tbody> <tr> <td>Work being thrown from chuck.</td> <td>Make sure that work is tightened in chuck/between centres.</td> </tr> <tr> <td>Chuck key being thrown from chuck.</td> <td>Ensure the work is securely held in place.</td> </tr> <tr> <td>Work becoming too hot.</td> <td>Adjust speed/Lubricate the work during turning.</td> </tr> <tr> <td>Clothing/hair becoming caught in moving parts.</td> <td>Hair tied back/wear apron.</td> </tr> <tr> <td>Guard not fitted or not lowered.</td> <td>Fit guard/Ensure guard is in place.</td> </tr> <tr> <td>Work being thrown from faceplate.</td> <td>Ensure work is clamped and balanced on faceplate.</td> </tr> </tbody> </table>	Risk	Precaution	Work being thrown from chuck.	Make sure that work is tightened in chuck/between centres.	Chuck key being thrown from chuck.	Ensure the work is securely held in place.	Work becoming too hot.	Adjust speed/Lubricate the work during turning.	Clothing/hair becoming caught in moving parts.	Hair tied back/wear apron.	Guard not fitted or not lowered.	Fit guard/Ensure guard is in place.	Work being thrown from faceplate.	Ensure work is clamped and balanced on faceplate.				
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	c	No answer or an inappropriate answer.		0	5	100														
		<p>The following points need to be referenced to gain marks:</p> <ul style="list-style-type: none"> <li>Marking out of 2 holes &amp; dividing lines.</li> <li>Drilling the 2 holes – flat bit/series of small holes.</li> <li>Cutting out with coping saw.</li> <li>Finishing the handle using files and glasspaper.</li> </ul> <p>1 mark – very basic understanding.</p> <p>2-3 marks – some detail and understanding related to tools, processes.</p> <p>4-5 marks – detailed understanding (most of above points referenced), clearly communicated.</p>	1 or 2 or 3 or 4 or 5																	

Question				On paper	Question Totals	Overall TOTAL
	d	(i)	No answer or an inappropriate answer.	0	1	16
			Only acceptable answer: Tapping			
		(ii)	No answer or an inappropriate answer.	0	4	20
			The following points need to be referenced to gain marks:  <ul style="list-style-type: none"> <li>• Marking out</li> <li>• Drilling the hole in the steel</li> <li>• Using a 5mm Tap</li> <li>• Use of Lubricant/Cutting compound</li> <li>• Keeping Tap vertical</li> <li>• 1/2 turn forward, 1/4 turn back</li> </ul> 1 mark – very basic understanding.  2-3 marks – some detail and understanding related to tools, processes.  4 marks – detailed understanding (most of above points referenced), clearly communicated.	1 or 2 or 3 or 4		
						<b>20</b>
						<b>105</b>

Question				On paper	Question Totals	Overall TOTAL
8	a	<i>No answer or an inappropriate answer.</i>	0	3	3	108
		Only acceptable answers: <b>Epoxy Resin</b>  <b>Contact Adhesive</b>  <b>Tensol cement</b>				
		<hr/>				
	b	<i>No answers or an incorrect answers.</i>	0	3x1	6	111
		Only acceptable answers: Stage 1: <b>Pilot</b>  Stage 2: <b>Clearance</b>  Stage 3: <b>Countersink</b>				
		<hr/>				
	c	<i>No explanation or an incorrect explanation.</i>	0	2	8	113
		Appropriate explanation but lacking detail. AWARD 1 mark E.g. There is more contact between the parts of the comb joint. Appropriate description well detailed. AWARD 2 marks E.g. More strength because of the increased contact between the 2 parts of the comb joint allowing for a larger gluing area.  <b>Answers related to:</b>  Mechanical fitting increases strength. Friction between 'teeth' of comb joint means that joint can be strong even without glue. Accurate alignment of pieces. Longer lasting. Comb joint can take more strain/stress/weight.	1 or 2			
		<hr/>				
	d	<i>No answer or an inappropriate answer.</i>	0	4	12	117
		Marks awarded for explaining the main operations:  <ul style="list-style-type: none"> <li>• Material placed on bed of Laser.</li> <li>• Laser focused to thickness of material.</li> <li>• Settings applied - high speed/low power for engraving (black) , low speed/high power for cutting (red).</li> <li>• Settings sent from PC to laser.</li> <li>• Reference to extraction (extraction turned on or can be automatic).</li> <li>• Engraving operation carried out first followed by cutting operation.</li> <li>• Work removed from laser.</li> </ul> 1 mark – very basic understanding (reference to 1 or 2 of the points above). 2 marks - more detail (reference to 3 or 4 of the points above). 3 marks - fairly detailed response (reference to 5 or 6 of the points above). 4 marks - detailed response (reference to 7 or 8 of the points above).	1 or 2 or 3 or 4			

Question				On paper	Question Totals	Overall TOTAL
			<hr/>			
8	e	<i>No answer or an incorrect answer.</i>	0	3	15	120
		<p>Marks awarded for discussing relevant factors such as:</p> <ul style="list-style-type: none"> <li>• Heating steel to red hot.</li> <li>• Dipping in carbon powder.</li> <li>• Allowing time for carbon to soak into steel.</li> <li>• Repeating above 2 or 3 times.</li> <li>• Re-heating to red hot.</li> <li>• Quenching in water.</li> </ul> <p>1 mark – basic understanding (reference to 1 or 2 of the points above)  2 marks - more detail (reference to 3 or 4 of the points above)  3 marks - detailed response (reference to 5 or 6 of the points above)</p>	1  or  2  or  3			
					<b>15</b>	<b>120</b>